Institute of Polar Studies

Report No. 68

Genesis and Classification of Arctic Coastal Plain Soils, Prudhoe Bay, Alaska

by

Robert J. Parkinson

Institute of Polar Studies
and
Department of Agronomy

November, 1978

The Ohio State University
Institute of Polar Studies
Columbus, Ohio 43210

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Institute of Polar Studies
The Ohio State University
125 South Oval Mall
Columbus, Ohio 43210

Mr. Parkinson's present address: Licking County Soil Survey Office, 799 Hebron Road, Newark, Ohio 43055

ABSTRACT

A soil survey was conducted over some 140 km^2 of oil field at Prudhoe Bay, Alaska during the 1974 and 1975 field seasons. The survey involved both field study and laboratory characterization of the typical soils. Soil-land form relationships were studied, and soil genesis was hypothesized. Soil genesis, morphology and classification were found to be closely related to geomorphic processes including: (1) the thaw lake cycle, (2) patterned ground formation and (3) differential loess deposition. The U.S. Department of Agriculture-Soil Conservation Service classification system, Soil Taxonomy, was tested relative to these soils, and some classification modifications were proposed involving: (1) the definition of the pedon, (2) recognition of the pergelic temperature regime at the suborder level and (3) the definition of organic soil material. Several classification modifications of a minor nature were developed involving the establishment of new taxa at the subgroup level.

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INTRODUCTION

Pedologic investigations conducted in northern Alaska during the last twenty years have mainly been concerned with the classification, characterization and mapping of major genetic soils occurring in the western part of arctic Alaska (Drew, 1957; Douglas, 1961; Tedrow and Hill, 1955; Tedrow and others, 1958; Holowaychuk and others, 1966; Rieger, 1966). More recently, pedologic investigations have been conducted in the largely unstudied eastern sector of the Alaska Arctic Coastal Plain at Prudhoe Bay as part of an approach to ecosystem analysis by the U.S. International Biological Program, Tundra Biome (Everett, 1975; Everett and Parkinson, 1977). The purpose of this report is to present the detailed findings of this study.

The primary objectives of this investigation were: (1) to conduct a soil survey of the Prudhoe Bay oil field; (2) to study soil morphology and soil-landform relationships there; (3) to provide laboratory characterization of the typical soils; (4) to hypothesize soil genesis from soil morphology and characterization data; (5) to test the USDA-SCS classification system, Soil Taxonomy on these cold region soils, and, having tested the system, (6) to propose appropriate suggestions or modifications relative to classification.

DESCRIPTION OF THE AREA

Physical Geography

The North Slope of Alaska extends from the glaciated and unglaciated foothills of the Brooks Range northward to the flat coastal plain, terminating at the shores of the Arctic Ocean. Prudhoe Bay is located along the Arctic Coastal Plain at approximately 70°20' N latitude, 148°20' W longitude and lies at the extreme northern edge of Alaska's continuous permafrost zone (Fig. 1). The soil survey area included approximately 140 km^2 of oil field.

Topography

The Prudhoe Bay area is generally flat with slopes dominantly ranging from 0 to 2 percent over most of the area. Gentle slopes of 2

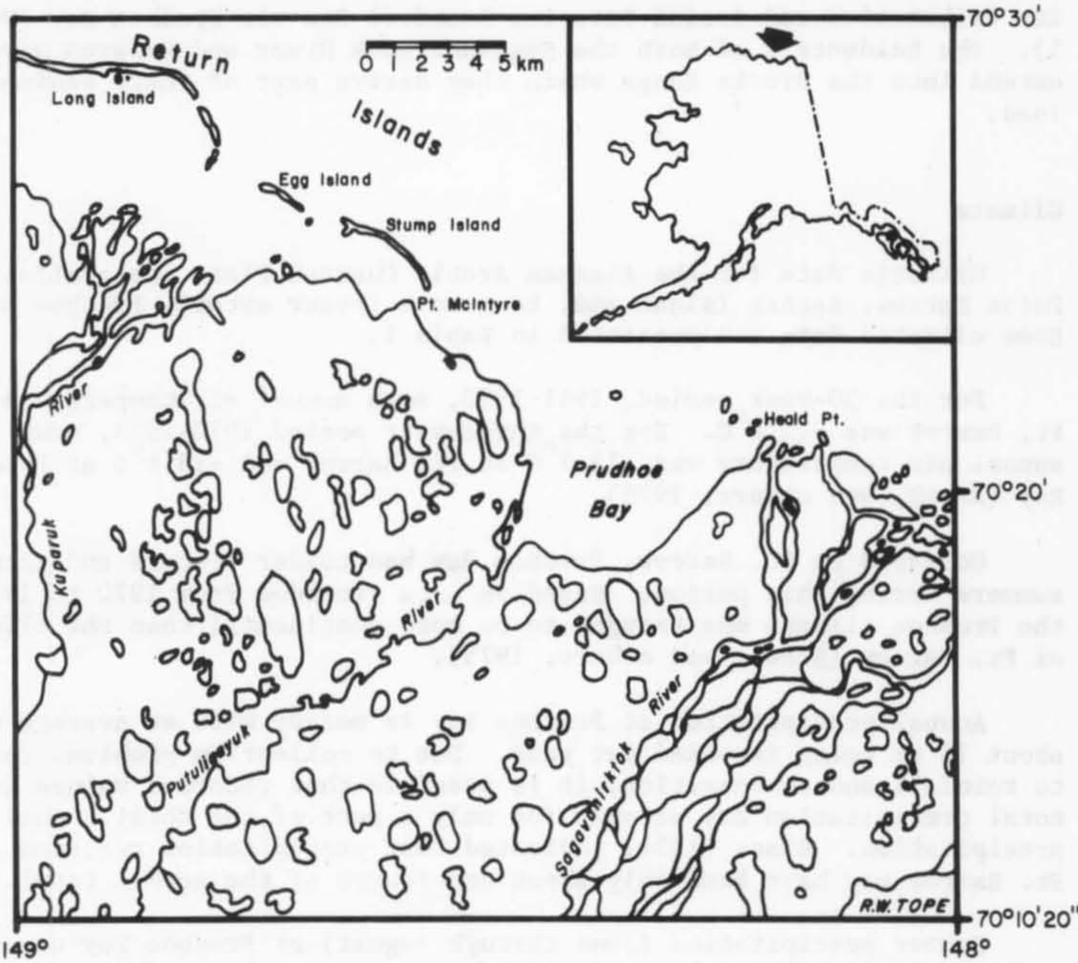


Figure 1. General area of reference. (From: Point Barrow Sectional Aeronautical Chart, 1968)

to 6 percent are associated around drained lake basins, and sloping to steep topography (slope ranging from 6 to 35 percent) is associated with dissection slopes and pingos.

Land surface elevations range from about 3 to 8 m along the coast to between 15 to 23 m about 20 km inland. Generally, macrorelief differences are usually less than 1 meter, however, relief differences as great as 15 m exist between the bases of some of the larger pingos and their summits. Relief differences of as much as 10 m also exist between upland river bluffs and the larger rivers.

The study area is bounded to the east by the Sagavanirktok River. The east channel of the Sagavanirktok River drains into the Beaufort Sea via Foggy Island Bay while the west channel drains directly into the Beaufort Sea. The Kuparuk River marks the western boundary of the study area. This river drains into the Beaufort Sea via Gwydyr Bay. The central part of the study area is drained by the Putuligayuk River and its tributaries and drains into the Beaufort Sea via Prudhoe Bay (Fig. 1). The headwaters of both the Sagavanirktok River and Kuparuk River extend into the Brooks Range where they derive part of their sediment load.

Climate

Climatic data for the Alaskan Arctic Coastal Plain are available for Point Barrow, Barter Island and, to a much lesser extent, Prudhoe Bay. Some climatic data are presented in Table 1.

For the 30-year period, 1941-1970, mean annual air temperature at Pt. Barrow was -12.6°C. For the three-year period 1970-1973, mean annual air temperature was -12.7°C at Pt. Barrow and -13.6°C at Prudhoe Bay (Brown, and others, 1975).

Compared to Pt. Barrow, Prudhoe Bay had colder winters and warmer summers during this period. Based on data recorded from 1970 to 1973, the Prudhoe climate was thought to be more continental than the climate of Pt. Barrow (Brown, and others, 1975).

Annual precipitation at Prudhoe Bay is meager with an average of about 16 cm being recorded per year. Due to collection problems related to rainfall and condensation, it is possible that recorded values for total precipitation may account for only a part of the total annual precipitation. Black (1954) indicated that precipitation recorded at Pt. Barrow may have been only about one-fourth of the actual total.

Summer precipitation (June through August) at Prudhoe Bay usually occurs as rain, although snowfall is not uncommon during this period. Winter snow blankets the landscape and has an average water equivalent of about 10 cm (Benson, and others, 1975). For the study area, mean April snow depth is 40 cm (K.R. Everett, personal communication).

TABLE 1

Mean Monthly Coastal Climatic Data Applicable to Prudhoe Bay

	J	F	M	A	M	J	J	A	S	O	N	D	M
Temperature* (°C)	-29.2	-31.8	-31.0	-20.2	-6.7	2.6	6.4	4.8	-0.8	-12.5	-19.0	-25.3	-13.6
Precipitation Total (mm)	10.2	8.9	5.1	4.3	6.4	13.0	22.4	26.7	23.9	21.3	10.2	7.4	13.3
Snowfall (cm)	15.0	8.1	7.4	6.6	7.9	3.8	1.0	4.1	16.3	24.4	14.5	9.7	9.9
Snow cover (cm)	40.6	43.2	40.6	38.1	12.7	-	-	-	-	20.3	30.1	33.0	32.3
Wind (m/sec)	6.3	6.2	6.0	5.4	5.5	5.1	4.7	5.2	5.8	6.4	6.7	6.2	5.8
Prevailing Wind Direction	W	W	W	W	E	ENE	ENE	E	E	E	E	E	ENE
Relative Humidity (Percent)	68	68	68	75	86	89	89	91	91	84	74	68	79

From: Everett and Parkinson, 1977

Sources: Battelle, Columbus Laboratories, unpublished data; U.S. Department of Commerce, 1970; Brown and others, 1975.

* 1970-1973 means

Winds are brisk and are predominantly from the east-northeast in the summer and are usually from the west in the winter.

Much of the seasonal snow cover usually melts by mid June exposing the sediment of the alluvial plains and dune fields. Unprotected against the brisk easterly winds, the finer grained sediment is subject to blowing. For this reason, the easterly winds are more efficient in transporting sediment than are the western winds, apparently moving "several times" more sediment (Benson and others, 1975).

Vegetation

The tundra vegetation of the Prudhoe Bay region is comprised dominantly of water tolerant sedges, mosses and grasses in the wettest sites, i.e. those with aquic or peraquic moisture regimes and grades to sedge, dwarf willow and lichen as drainage improves.

The vegetation was studied intensively by Webber and Walker who related dominant species to a characteristic microsite or landform (Webber and Walker, 1975).

Basically, Carex aquatilis and/or Arctophila fulva were found occupying moderately deep water (30-100 cm) of thaw lake margins. Carex aquatilis and/or Eriophorum angustifolium with Drepanocladus spp. existed in centers and troughs of low center polygons and some other areas of poor or very poor drainage. Dryas integrifolia and dwarf willow were associated with Carex aquatilis and/or Eriophorum angustifolium on low center polygon rims and flat areas that have somewhat better drainage.

The more mesic drainage conditions, i.e. drier polygon rims and other areas of better drainage, are characterized by Dryas integrifolia and Cetraria spp. in combination with other lichens and sedges. On the tops of high center polygons and creek bluffs, Dryas integrifolia and cushion dicotyledons were associated with crustose and fruiticose lichens.

Dryas integrifolia, Carex rupestris and Oxytropis nigrescens were found on excessively drained pingos. In addition, Salix rotundifolia and Cassiope tetragona were found to occupy snowbanks (Webber and Walker, 1975).

Geology

The Arctic Coastal Plain Province consists of Gubik Formation--unconsolidated marine and non-marine sand, silt, clay and gravel of Quaternary age (Black, 1964). Over the North Slope, this formation varies in thickness from a thin surface mantle to about 50 m thick.

The Gubik Formation, west of the Colville River, as studied by Black (1964) is comprised of three primary lithologic units--the Skull Cliff unit, Meade River unit and Barrow unit.

The Skull Cliff unit is the oldest, consisting of poorly sorted, black to dark gray sediment ranging from clay to cobble-size. Maximum observed thickness is about 6 m. The Meade River unit is of intermediate age and consists mainly of well sorted yellow, buff or light tan quartz sand. Its maximum observed thickness is about 60 m. The Barrow unit is the youngest and is comprised of well sorted to poorly sorted admixtures of clay to gravel-size sediment. Color ranges from yellow to black with organic matter being abundant in the upper part. This section consists of marine sediment at the base, and lacustrine or fluvial sediment at the top of this unit. Thickness of the Barrow unit is apparently about that of the Skull Cliff unit (Black, 1964).

In the Pt. Barrow vicinity, Sellmann and Brown (1973) correlated the local stratigraphy with two of Black's three primary lithologic units--the Barrow unit, and the underlying Skull Cliff unit. The Barrow unit consisted of a highly reworked organic and ice rich sediment overlying well sorted coarse textured sediment that exhibited its depositional structure. Thickness of this unit varied from 7 to 10 m. The Skull Cliff unit generally consisted of interbedded and commonly contorted silts and sands.

Sellmann and Brown (1973) concluded that the Barrow unit was deposited in mid-Wisconsinan time during the last major marine transgression that occurred over the coastal plain province. This was followed by recession and uplift with the subsequent formation of permafrost (Sellmann and Brown, 1973).

Based on morphology and composition, the upper section of the Gubik Formation at Prudhoe Bay, as observed in pingo exposures, appears relatively similar to the upper section as described by Sellmann and Brown (1973). These well sorted sediments, in turn, are mantled with peat and/or Holocene loess that is derived from the adjacent braided stream channels, particularly from the Sagavanirktok River flood plain. The chemical and mineralogical nature of the loess is largely dependent on the parent rock from which it is derived.

Bedrock exposed along the headwaters of the Sagavanirktok River in the Brooks Range includes: (1) Devonian conglomerate, sandstone and slate to the south of Galbraith Lake; (2) Mississippian limestone, chert and shale to the southeast of Galbraith Lake; (3) Triassic and Permian shale, siltstone, sandstone and limestone to the northeast of Galbraith Lake. Further north along the river to about $69^{o}25'$ N are Cretaceous and Jurassic clastics. Overall, calcareous rock in the Brooks Range is exposed along the Sagavanirktok River from about $68^{o}20'$ N to $68^{o}30'$ N (Ferrians, 1971a; 1971b).

Weathering and mass wasting of these rock formations provide a generally calcareous sediment load for transport by the Sagavanirktok River. In turn, some of this calcareous sediment ultimately undergoes deflation and is deposited over parts of the study area as loess or eolian sand.

Permafrost

Due to the severity and lengthy duration of northern Alaska's rigorous climate, the Arctic Coastal Plain is underlain with perennially frozen ground or permafrost. Permafrost is defined as "... rock or soil material, with or without included moisture or organic matter, that has remained below $0^{o}C$ ($32^{o}F$) continuously for two or more years" (Ferrians, and others, 1969). In the Prudhoe Bay area, permafrost extends to depths of some 600 m (Brown and Sellmann, 1973).

Typically, over the flat and poorly drained terrain of the study area, only the upper few decimeters of soil thaw during the brief arctic summer. The vertical portion of the terrain which thaws seasonally is termed the active layer. The contact between the active layer and the underlying permafrost is termed the permafrost table. Maximum thaw depths occur in the excessively drained, coarse textured soils of elevated landforms such as sand dunes and pingos.

Throughout the Prudhoe Bay study area, the upper part of permafrost existing just below the permafrost table is typically fine textured with a high ice content. Perennial ground ice exists in various forms including small lenses, films and wedges. Brown and Sellmann (1973) report that interstitial ice may occupy as much as 80 percent of the permafrost volume in the upper 3 or 4 m. A second type of permafrost, with a low ice content, underlies the coarse textured, excessively drained soils, but this type is of minor extent.

The thaw lake cycle and cryoturbic activity related to patterned ground formation are two important geomorphic processes affecting landscape evolution that will be considered in this report.

Thaw Lake Cycle

Elliptical thaw lakes are a dominant geomorphic feature of the Arctic Coastal Plain Province (Fig. 2a). Existing over some 65,000 km^2 (25,000 mi^2) of northern Alaska (Black and Barksdale, 1949), these lakes are oriented with the primary axis generally aligned N 15^{o} W (Wahrahftig, 1965), normal to the prevailing wind. According to Sellmann, and others (1975), thaw lakes occupy from 10 to 15 percent of the Prudhoe region. Locally, however, thaw lakes may occupy 30% of an area (J. Brown, personal communication).

a

b

Figure 2. (a) Oblique aerial view of thaw lakes in the Prudhoe Bay area. (b) Erosion occurring along lake edge. Note organic rich sediment at edge of lake.

The concept of a thaw lake cycle, including the formation, migration and disappearance of these oriented thaw lakes has been proposed by Hopkins (1949).

The oriented lakes are thought to be produced through the formation and coalescing of small ponds that generally develop amid patterned ground as a result of local permafrost degradation. As the cycle proceeds, these ponds enlarge and deepen as the subjacent permafrost thaws and subsides. Lake expansion is partially related to bank thaw along the lake periphery. Here, permafrost underlying the adjacent soil thaws causing massive blocks of tundra to collapse into the lake (Fig. 2b). As a result, the lake expands or migrates. Rate of bank retreat or lake migration observed at one location in northern Alaska over a 14-year period averaged about 0.3 m (1 ft.) per year (Tedrow, 1969).

Wave action differentially distributes the newly slumped mineral and organic sediment throughout the lake basin. Ultimately, the lake "disappears" through its complete or partial drainage by stream capture. The formerly depressed permafrost table below the basin rebounds upon lake drainage. This, in turn, impedes internal drainage by restricting downward movement of water. This creates conditions favorable to colonization of the basin by water tolerant sedges, mosses and grasses. Carson (1968) has estimated that revegetation of these exposed basin shelves in arctic Alaska requires from 10 to 20 years. Sedge and moss accumulation produce a surficial organic horizon overlying the reworked lacustrine sediment. Over time, various processes such as ground ice accumulation and lake basin revegetation act in such a way that ".... all visible traces of the former lake vanish" (Bird, 1967). Soil forming processes would proceed until the next transgression by a migrating thaw lake. A flow diagram of landscape evolution involving the thaw lake cycle is presented in Figure 3.

Sellmann and Brown (1973) state that the thaw lake cycle has been a dominant geomorphic process operating in northern Alaska for the past 10,000 years. Based on radiocarbon dating of lake strands or shelves at Pt. Barrow, Carson (1968) suggested that a thaw lake transgressive stage reached maximum development between 4,000 and 8,000 years B.P., possibly equivalent to the hypsithermal. Since post-hypsithermal cooling (about 3500 years B.P.) the regional lake cycle has exhibited a regressive stage resulting from increasing incidence of lake drainage by stream capture (Carson, 1968).

It has been estimated that thaw lakes have intensively reworked about 75 percent of the landscape near Barrow (Carson, 1968). Field study and aerial photo interpretation of the Prudhoe Bay study area indicate that thaw lakes, at one time or another, have reworked virtually the entire region.

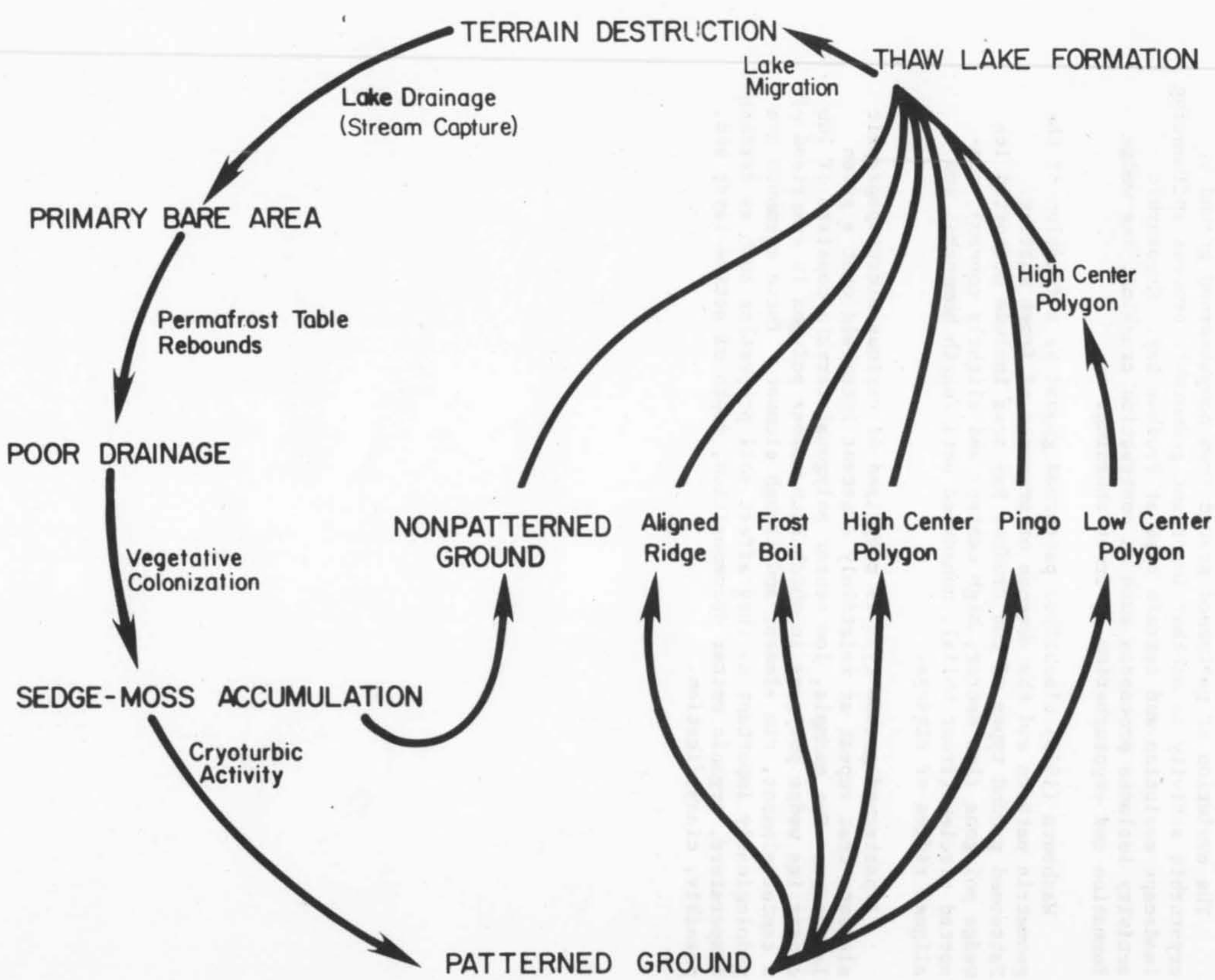


Figure 3. Flow diagram of hypothesized landscape evolution in the Prudhoe Bay Region.

Cryoturbic Activity

The evolution of patterned ground from nonpatterned ground by cryoturbic activity is another important geomorphic process influencing landscape evolution and terrain type at Prudhoe Bay. Cryoturbic activity includes processes such as contraction cracking, ice wedge formation and cryoturbation or frost churning.

Washburn (1956) classified patterned ground as a function of the geometric pattern and the absence or presence of frost sorting. Patterned ground types of the Prudhoe Bay area include nonsorted ice wedge polygons (low center, high center, and slightly convex), nonsorted circles (frost boils), nonsorted nets (earth hummocks) and aligned ridges or strangs.

A patterned ground type is comprised of various microtopographic elements that repeat at relatively constant intervals over a given landscape. For example, low center polygonal terrain consists of low center ice wedge polygons in which each member polygon is comprised of a center element, rim element and trough element. These elements are pedologically important as they affect soil properties such as drainage, temperature, organic matter decomposition, depth of active layer and, possibly, classification.

METHODS

Field

Field study of the soils involved three phases: (1) mapping at a 1:6,000 scale; (2) descriptive work, and (3) soil sampling. Soil mapping of approximately 140 km^2 was conducted from July 18 to August 31, 1974. Mapping rates of the 1974 field season averaged approximately 1 section (259 ha) per day.

Descriptive work was conducted during the 1974 and 1975 field seasons. Terminology and horizon nomenclature were adopted from the U.S.D.A. Handbook Nos. 18, Soil Survey Manuel (Soil Survey Staff, 1951) and 436, Soil Taxonomy (Soil Survey Staff, 1975). Color designations were made according to Munsell soil color charts. Soil reaction was determined in the laboratory.

Soil sampling was conducted throughout the study area during the 1974 and 1975 field seasons in conjunction with the descriptive work (Fig. 4). Data from 24 sample sites representing the principal soils will be presented in this report so that these soils can be characterized on a regional scale.

On a smaller scale, soils occupying the various cyclically repeating landform elements of patterned ground types were described and sampled to determine or characterize the degree of local variation occurring within a given patterned landform. Sites sampled in 1974 were numbered according to the aerial photos on which they occurred. Sites sampled in 1975 were numbered consecutively from 1 to 22. Letters following the number denote landform element as follows: C = center element (polygon); R = rim element (polygon) or ridge element (aligned ridge terrain); T = trough element (polygon); H = hummock element; IH = interhummock element; F = basin flat. For example, a site is indicated as follows: P-2R,P = Prudhoe; 2 = second site sampled; R = rim element. Areas of each repeating landform element for sample sites were determined by both field and photogrammetric measurements.

Laboratory Characterization

Laboratory analyses of soil samples were conducted at the Soil Characterization Laboratory of the Agronomy Department, The Ohio State University. Analyses were selected to aide in soil classification and included soil reaction, calcium carbonate equivalent organic carbon content, and particle size distribution.

For soil reaction (pH) determination a ratio of one part soil sample to one part distilled water was mixed and allowed to equilibriate for one hour. The pH was then measured using a Beckman, Expandomatic SS-2, pH meter. A ratio of one part soil sample to one part 0.01 M

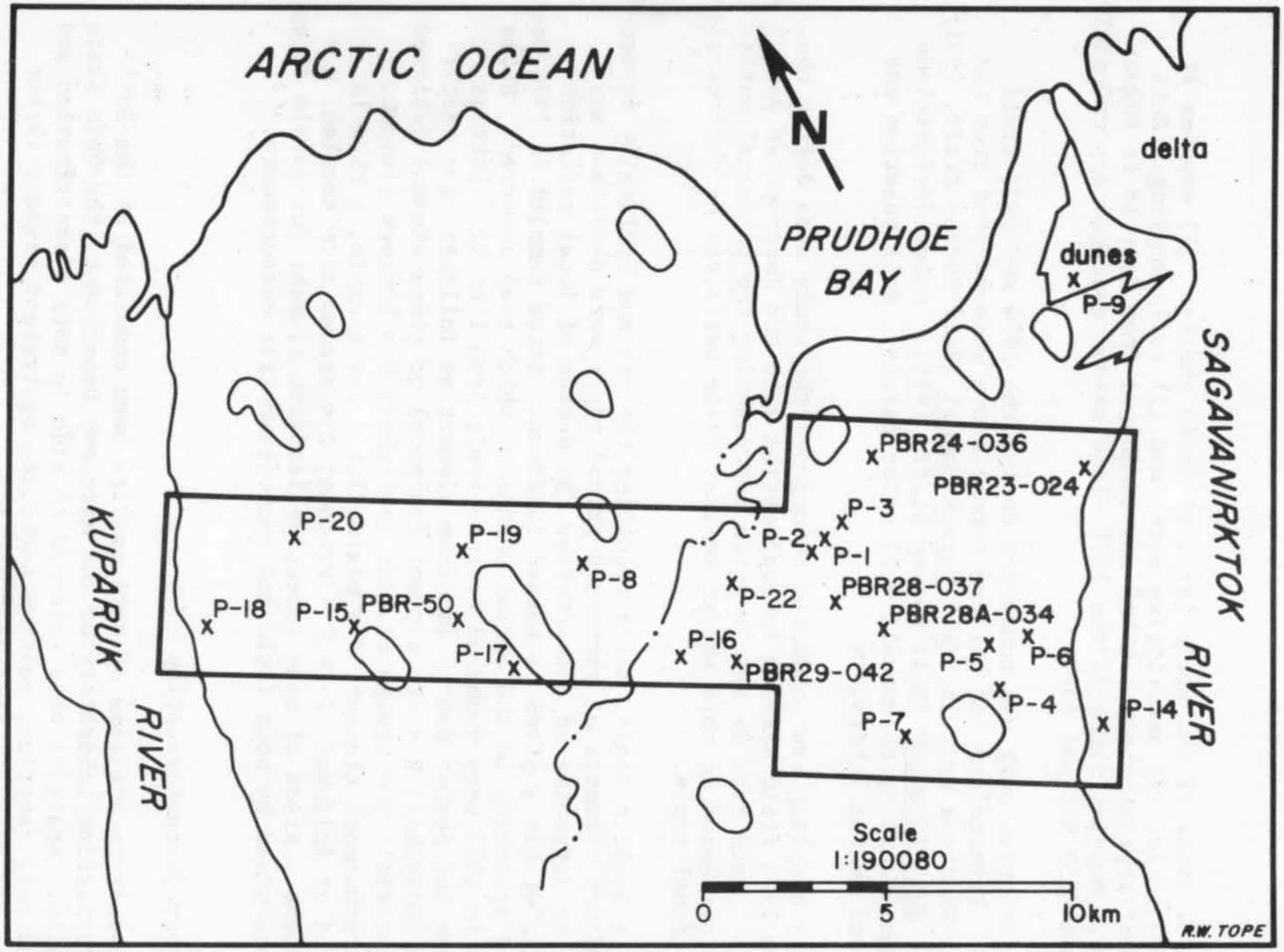


Figure 4. Map of Prudhoe Bay study area showing sample site locations.

$CaCl_2$ solution was also used for pH determination. Soil reaction class as described for organic soil material is based on the $CaCl_2$ suspension.

For determination of calcium carbonate equivalent, percent calcite and percent dolomite were determined gasometrically by the Chittick Apparatus using the procedure of Dreimanis (1962). Soil samples were ground sufficiently so that they could pass a 200 mesh screen. Uniform surface area is essential for an accurate determination of calcite and dolomite contents since the gasometric differentiation between calcite and dolomite is based on differential reaction rates with HCl. Weighed samples of 1.7000 g were placed in reaction flasks. A pipette delivered 20 ml of 6N HCl to each flask and the volume of CO_2 evolved within the first 30 seconds was recorded. Percent calcite was calculated from this value. A second reading of CO_2 evolution was taken after all the carbonate had reacted. This value was usually recorded after 30 minutes. Percent dolomite was calculated from the second reading of CO_2 evolution. Calcium carbonate equivalent is basically the summation of percent calcite and percent dolomite.

Organic carbon content was determined by the Dry Combustion Method. This method was initially devised by Salter (1916) and was later modified by Winters and Smith (1929). Soil samples ranging from 0.25 to 1.0 g, depending on the amount of anticipated carbon, were each mixed with about 0.25 g MnO_2 and were then ignited in an electric furnace at temperatures of 900° to $950^\circ C$ for 10 minutes. During ignition, a steady flow of oxygen passed through the combustion tube aiding in oxidation, and the evolving CO_2 was collected in a pre-weighed ascarite absorption bulb. The carbon content was based on the mass of evolved CO_2 and the sample weight. In addition to the organic-carbon determination made, this procedure also determined the amount of inorganic carbon associated with the carbonate fraction of calcareous soil samples. To correct this situation, the amount of inorganic CO_3-C was calculated from the $CaCO_3$ equivalent and was subtracted from the total carbon determination made from the Dry Combustion Method. The difference was equal to the organic carbon content.

Particle size analyses were determined by a modified procedure of Kilmer and Alexander (1949). Sodium hexametaphosphate was used as a dispersing agent. Organic matter was oxidized by hydrogen peroxide, if the organic matter content of the sample equalled or exceeded 3 percent organic matter. Silt and clay fractions were separated by sedimentation and were determined gravimetrically. Sands were fractionated by sieving. Particle size analysis was mainly performed on samples qualifying as mineral soil material as defined by the U.S. Department of Agriculture (Soil Survey Staff, 1975). Some limited particle size analyses are reported for samples comprised or organic soil material.

The soils of the Prudhoe Bay study area vary greatly along a drainage gradient and, to a lesser extent, along an east-west geographical gradient. This pedologic variation is the result of the interaction between the soil forming factors--climate, parent material, time, relief and biotic--each of which operates in varying intensities or degrees along these two gradients.

PEDOLOGIC--GEOMORPHIC RELATIONSHIPS

Several geomorphic processes previously alluded to involving the thaw lake cycle, cryoturbic activity and loess deposition, were determined to influence soil genesis and morphology by affecting the soil forming factors, to varying degrees. Each of the above processes and their impact upon the soil forming factors will be considered.

Thaw Lake Cycle

During the 1974 field mapping, it was noticed that the lower section of the active layer almost invariably consisted of a highly organic, dark colored, silty material that existed beneath a surficial sedge-peat horizon. This organic and silt rich material usually was observed to extend below the permafrost table where its composition varied considerably horizontally and vertically.

Forty-two samples of this material, taken from 11 sample sites located throughout the study area, averaged 13.4 percent organic carbon (range, 2.4 to 29.5 percent). Textural data from seven of these sites showed the silt content to average 60.5 percent (range, 20.1 to 90.2 percent). Sand content averaged 30.1 percent and clay averaged 9.4 percent. The average texture of the mineral fraction of the organic rich sediment was that of a silt loam, ranging from fine sandy loam to silt. A limited number of drill logs from the area indicate the thickness of this organic rich stratum ranges from 0.75 m to about 2 m (K.R. Everett, personal communication).

The horizontal and vertical variation observed throughout the study area in perenially frozen sediment corresponded to the local variation existing in one thaw lake basin which had been recently artifically drained at Prudhoe Bay. Evidence obtained from a transect across this recently drained lake basin indicates that silt and finely divided organic material, in this instance sapric material (Oa), are deposited largely in the center portion of the basin. Sand and raw or intermediately decomposed organic materials, in this case hemic sedge material (Oe), are primarily deposited along the lake margins.

Six pedons along the drained lake basin transect were described (Appendix, P-16, p. 106; Figs. 5, 6 and 7) and two were sampled--P-16E, located at the lake edge and P-16F, located in the flat basin center. These lake sediments are schematically illustrated in Figure 5.

The sediment of P-16E consisted of 36 cm of hemic material underlain by 25 cm of sapric material. Organic carbon values ranged from 18.3 percent to 26.1 percent. These percentages are well above the minimum values for organic soil material as established in Soil Taxonomy (Soil Survey Staff, 1975). The surficial organic and silt

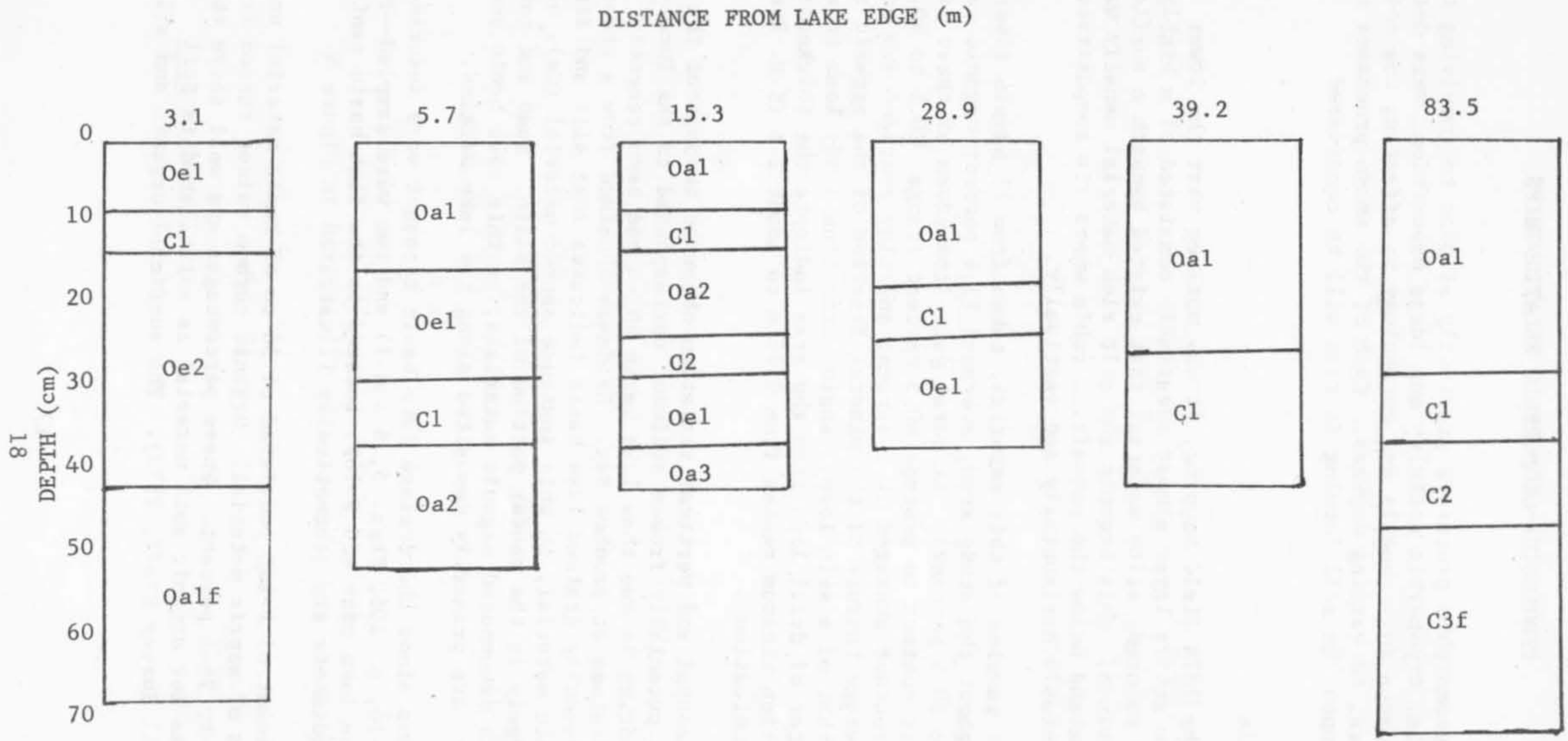
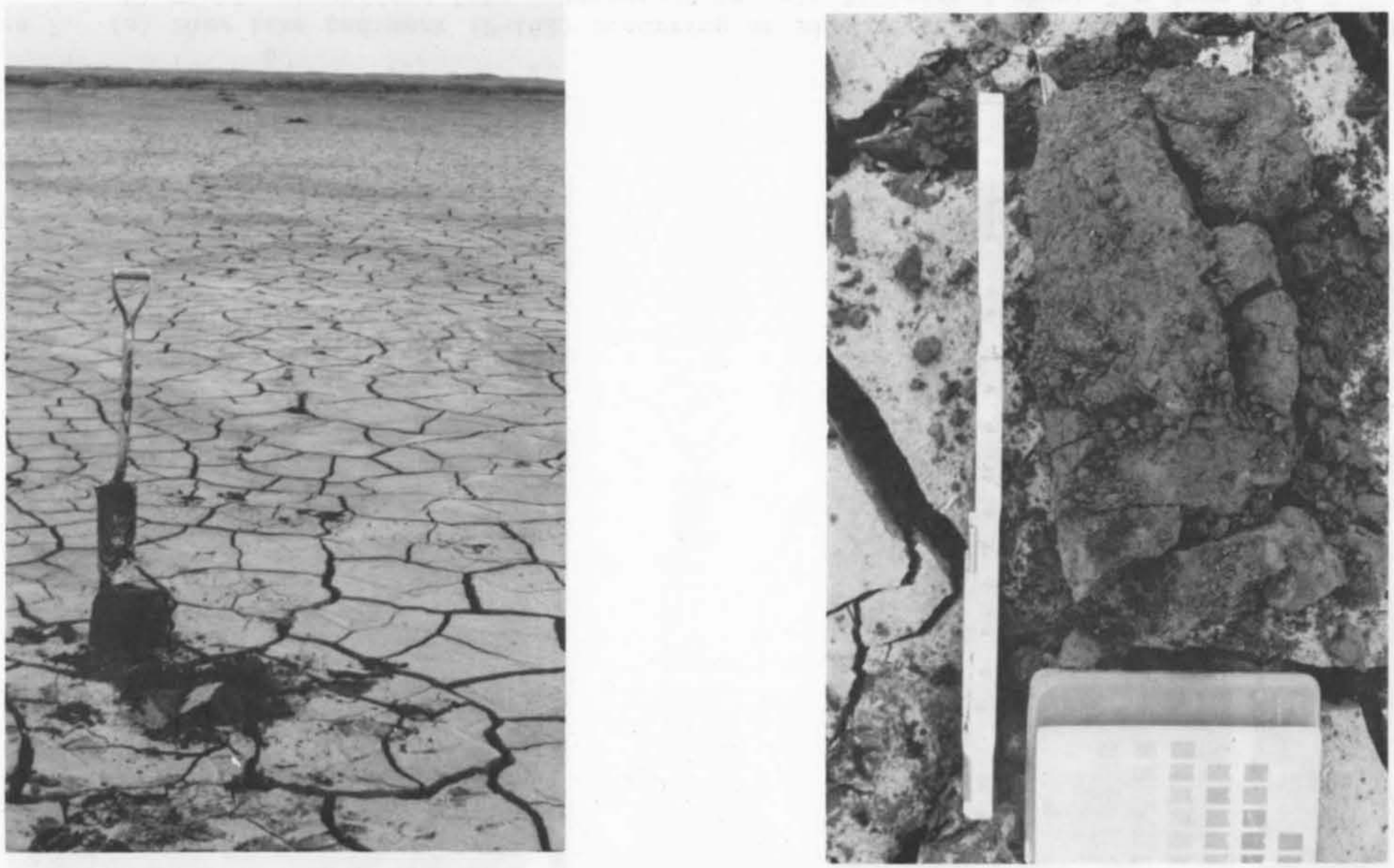
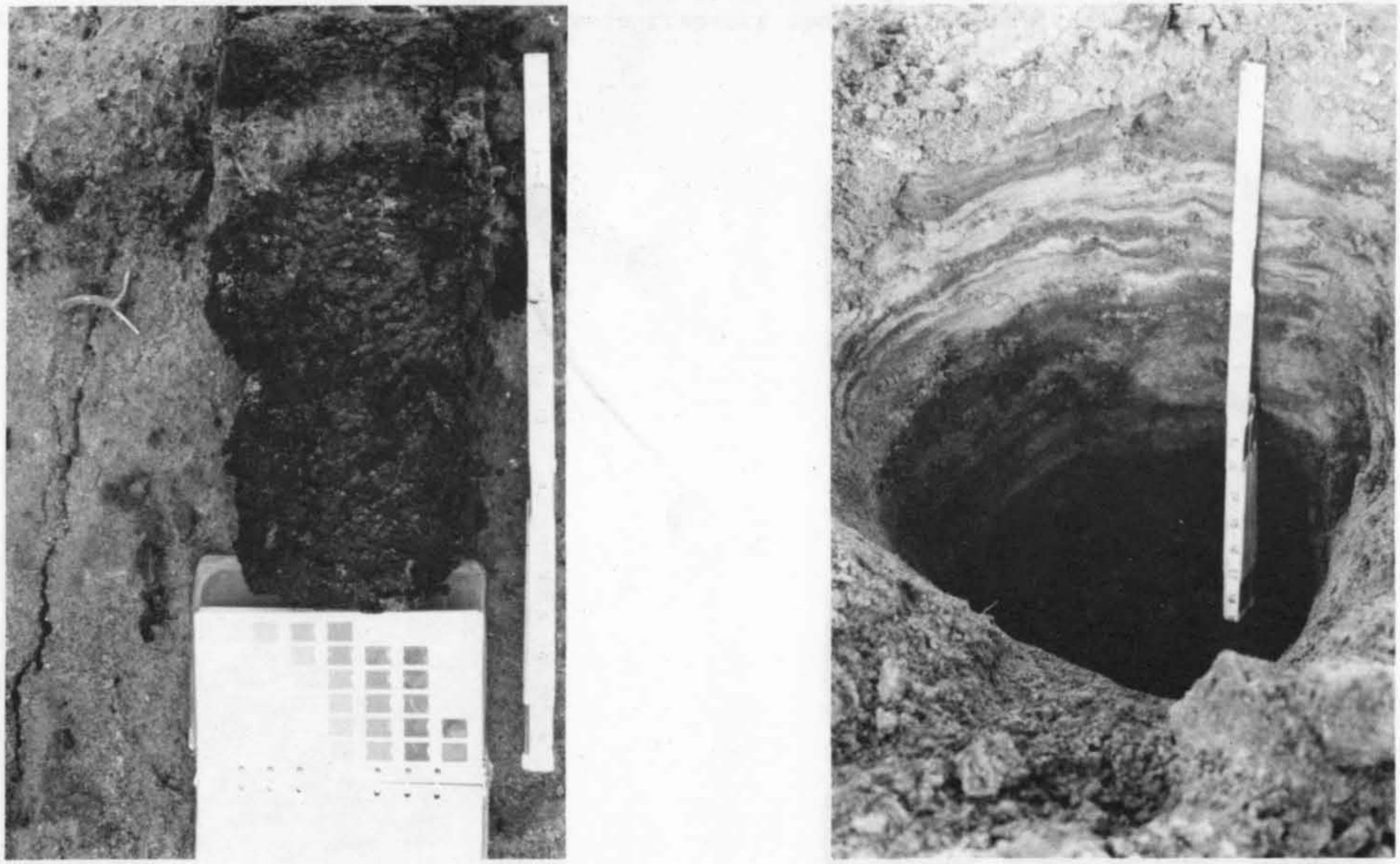


Figure 5. The nature of lacustrine sediment along a transect of a recently drained thaw lake basin at Pump Station No. 1. Sample Site P-16. Oa = sapric material; Oe = hemic material; C = mineral soil material; f = frozen.



a b

Figure 6. (a) Overview of drained lake basin transect showing polygonal cracking, site P-16. (b) Close-up view of sediment exposed in 6a (Appendix, P-16F, p. 111). Note highly organic nature of the material.



a b

Figure 7. (a) Thaw lake sediment (P-16E) occurring at edge of lake is dominantly hemic material. (b) Highly stratified lake sediment (P-16, pit 2) located about 3 m from P-16 E.

rich stratum of P-16F exhibited an organic carbon value of 13.0 percent. With a clay content of 10.3 percent, this stratum is classified as organic (sapric) material and is described as silty sapric material, based on the high percentage of the mineral silt fraction of the sediment.

Generally, the silty sapric material increased in thickness away from the lake edge. Correspondingly, the fine stratification and hemic sedge material, initially observed near the lake edge, were apparently absent about 40 m from the edge of the lake. Extrapolating from this 40 m value, the area of the lake basin underlain with hemic material is 0.13 km^2 or about 20 percent.

The somewhat decomposed (hemic) organic material probably represents soil material which recently collapsed into the lake basin as a result of lake expansion just prior to drainage. The sapric materials probably represent organic materials that have long been subjected to both biological and physical (mechanical) decomposition. This observation corroborates that of Tedrow (1969) who noted that organic matter associated with thaw lakes ranged from finely divided to fibrous and that, in lake basins, "clumps and slabs of matted peat are deposited intact." Tedrow also noted that most of the sedimentation was occurring along the margins of the lakes.

Since the classification of these Histosols at the suborder level is based on the dominant kind of organic soil material of the control section, about 80 percent of the basin initially would be occupied by Saprists with probably less than 20 percent of the basin consisting of Hemists or, in rare cases, Fibrists. Over pedologic time, sedge and moss accumulation would produce additional thickness of hemic or fibric materials overlying the organic rich lacustrine sediment. Limited radiocarbon dating of the base of surficial sedge horizons in the Prudhoe Bay study area indicates the age of the material to be on the order of 3900-4700 years B.P. (K.R. Everett, personal communication). As hemic or fibric materials become the dominant kind of organic soil material of the control section, the areal extent of Hemists and Fibrists, respectively, increases and the Saprists decrease. Hemists may regress over time to Saprists in very localized areas like polygon rims due to accelerated subsidence induced by patterned ground formation.

Loess Deposition

During the 1974 field mapping, a strong gradient in soil reaction throughout the oil field was observed. Soils in the eastern part of the region were mildly or moderately alkaline and were calcareous, whereas equivalent soils in the western part of the study area, some 15 to 20 km away, were commonly medium to strongly acid.

Although climatic data are generally lacking, limited wind direction data (Table 1) combined with aerial photo analysis and personal observation indicate the existence of strong prevailing winds at Prudhoe Bay out of the east to east-northeast during the summer months. Wind direction may be inferred from three features on the aerial photos: (1) the unidirectional orientation of a longitudinal sand dune field along the leeward side of the Sagavanirktok River delta, parallel to the prevailing winds (Fig. 8); (2) oriented thaw lakes with their primary axis normal to the sand dune orientation

0 km 5 km 10 km
(4.53" = 10 km)

Figure 8. Aerial photo showing the Sagavanirktok River flood plain and sand dune field on leeward side of delta (top center-left). Elliptical lakes appear in the various stages of the thaw lake cycle.

(hence, wind direction) (Fig. 8); and (3) the two airfields at Prudhoe Bay with their only runways also oriented parallel to the sand dune orientation. Summer field observations support the unidirectional hypothesis that was inferred from aerial photo interpretation.

As previously noted, the Sagavanirktok River derives some sediment load from calcareous rock in the Brooks Range. Calcium carbonate equivalent of the silt to fine sand size alluvium that is subject to blowing varied from 28.0 to 26.5 percent and was strongly effervescent. The very gravelly coarse sand textures underlying the silt and fine sandy loam textures exhibited relatively lower $CaCO_3$ equivalent of 15.0 and 15.4 percent. (Appendix, P-14, p. 103). Two samples of fine sand texture collected from a pedon in the dune field on the leeward side of the Sagavanirktok River delta also exhibited a relatively high calcium carbonate equivalence of 27.3 percent and 23.0 percent (Appendix, P-9, p. 102). It appears that the carbonate fraction dominantly exists as fine sand to fine silt size particles that are most subject to blowing. Theoretically, those areas most subject to loess deposition should exhibit the highest $CaCO_2$ equivalent.

Regional analysis of surface soil samples taken from equivalent landform elements in very poorly drained and poorly drained terrain showed that sites either directly downwind of the major loess source area (the Sagavanirktok River delta) or directly adjacent to the river exhibited higher $CaCO_3$ equivalent (Fig. 9, Tables 2 and 3). Generally, an indirect relationship existed between distance from source and magnitude of $CaCO_3$ equivalent. Evidently site P-20C is situated sufficiently north and west that little, if any, carbonate rich loess is deposited since the prevailing winds come in from over the ocean and not from over the river delta. Sites 8F and 19F which are situated somewhat further south and east of P-20C exhibit minimal effervescence and probably are subject to minor amounts of loess deposition.

In addition, an inverse relationship exists between organic carbon content (determined on a weight basis) and $CaCO_3$ equivalent probably indicating differential organic soil material dilution by calcareous mineral material (Tables 2 and 3, Figs. 10 and 11). This dilution is very difficult to discern in the field because the horizon volume is dominantly comprised of recognizable organic sedge material. This mineral dilution significantly affects soil classification, if not morphology, since critical values of organic carbon content are used to differentiate between mineral soil material and organic soil material.

Inspection of these linear regression graphs indicates that critical $CaCO_3$ equivalent limits exist and correspond to the class limits between mineral and organic soil material. Above this critical $CaCO_3$ equivalent limit, mineral soil materials are classified, and, below this limit, organic soil materials are classified. The critical $CaCO_3$ equivalent value for very poorly drained soils ranges from 15 percent for a sample with 10 percent clay to 17 percent for a sample with no clay. The 15 percent $CaCO_3$ equivalent value corresponds to the 13 percent organic carbon value that is required by definition to classify a sample containing 10 percent clay as organic. If the sample contains 0 percent clay, it must contain 12 percent organic carbon by definition to be classified as organic (Soil Survey Staff, 1975). For poorly drained soils of equivalent landscape positions, the critical $CaCO_3$ equivalent values ranged from 17 percent for a sample with 10 percent clay to 18 percent for a sample with no clay.

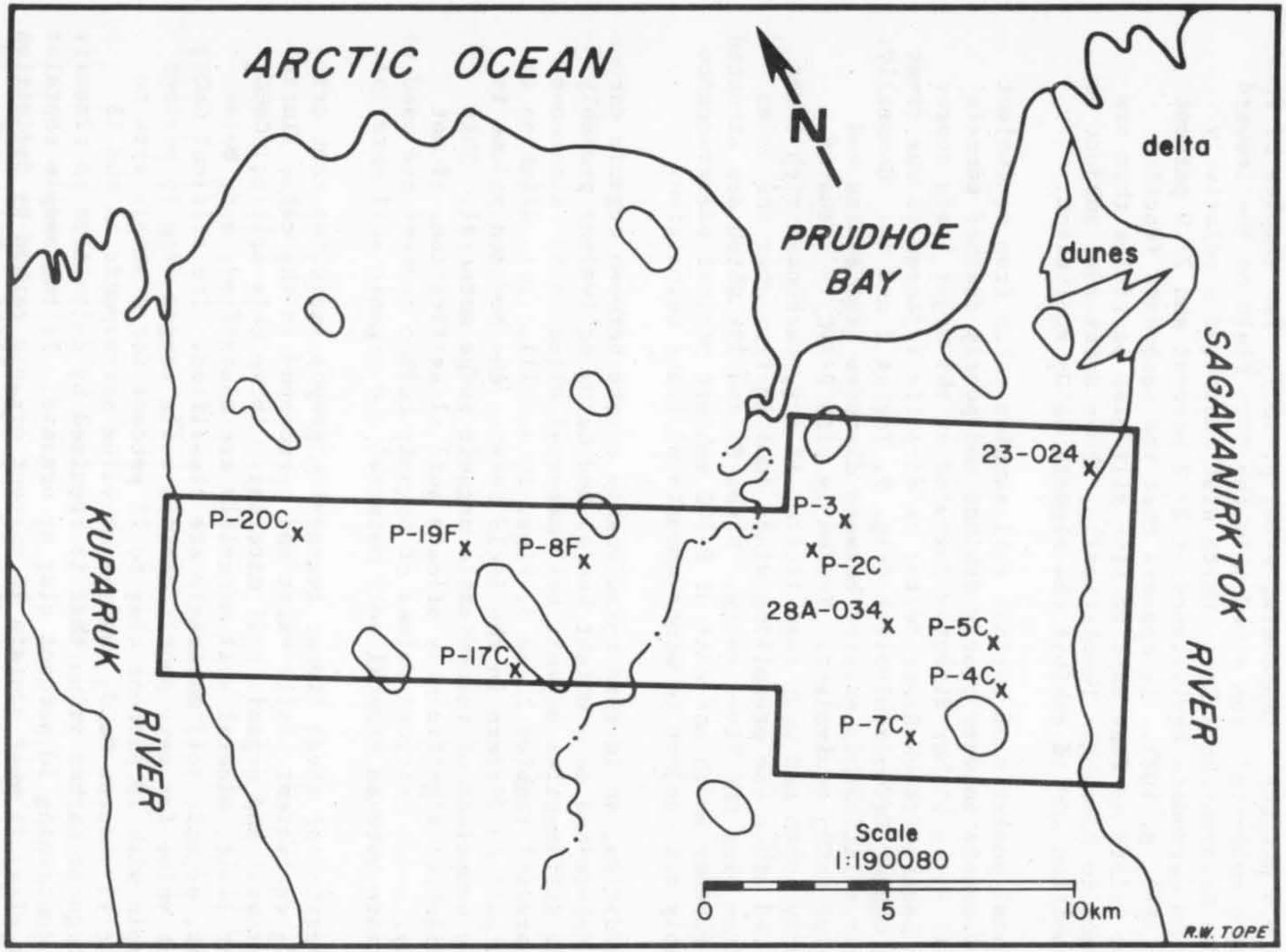


Figure 9. Map of Prudhoe Bay study area showing selected sample site locations for analysis of loess deposition.

SAMPLE		ORGANIC CARBON (%)	$CaCO_3$ EQUIVALENT (%)
SITE	NUMBER		
2C	3684	6.0	24.8
5C	3708	10.3	21.2
28A-034	3272	12.1	18.2
7C	3718	13.1	16.9
17C	3776	17.0	11.7
20C	3796	27.5	0.0

Table 2. Inverse relationship between organic carbon and $CaCO_3$ equivalent in surface organic horizons of six equivalent center element soils of low center polygonal terrain sampled throughout the study area.

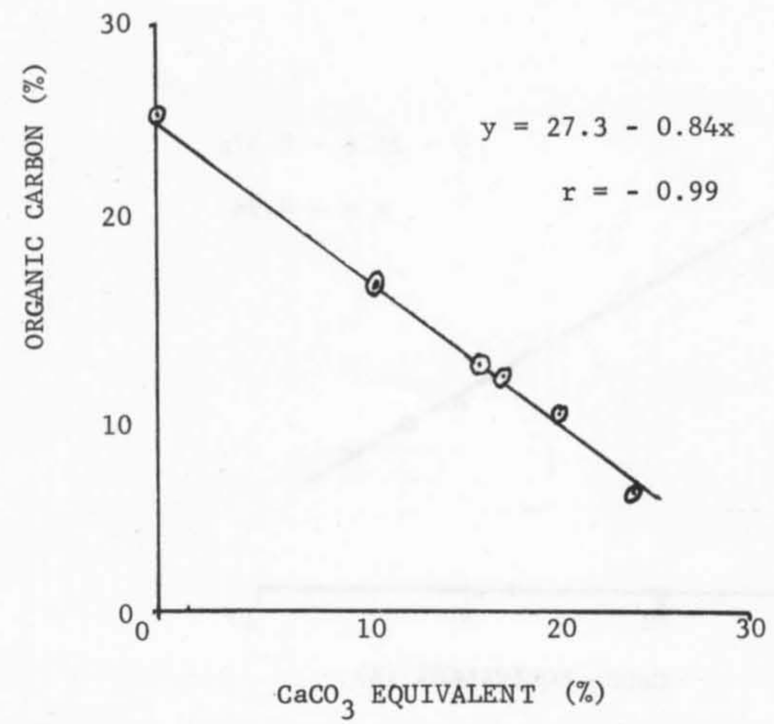


Figure 10. Linear relationship between organic carbon and $CaCO_3$ equivalent for surface horizons of six equivalent soils. Data from Table 2.

SAMPLE SITE	NUMBER	ORGANIC CARBON (%)	$CaCO_3$ EQUIVA-ENT (%)
23-024	3275	6.9	26.3
P-3	3695	8.4	22.9
P-4C	3697	9.4	20.4
P-8F	3721	19.5	1.0
P-19F	3793	22.4	1.8

Table 3. Inverse relationship between organic carbon and $CaCO_3$ equivalent in surface organic horizons of five equivalent soils with peraquic moisture regime sampled throughout the study area.

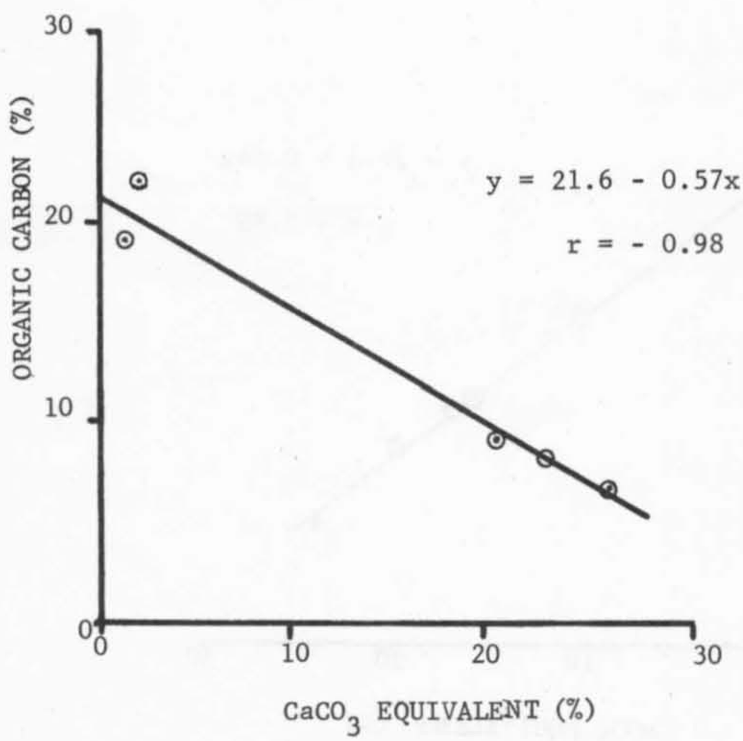


Figure 11. Linear relationship between organic carbon and $CaCO_3$ equivalent for surface horizons of five equivalent soils. Data from Table 3.

The soils in the eastern part of the study area exhibit surficial horizons of sedge peat that appear morphologically similar to their western counterparts except that the former are moderately alkaline (calcareous) and the latter are slightly to strongly acid. The organic carbon values of the sedge horizons are usually relatively low (less than 12 percent organic carbon) in the eastern part, failing to qualify as organic soil material. The western analogs exhibit high organic carbon values (greater than 12 percent organic carbon) and qualify as organic soil material. This discrepancy significantly affects the classification of these soils in that morphologically similar soils are classified as Inceptisols (mineral soils) in the eastern part of the study area and Histosols (organic soils) in the western part of the study area.

SOIL GENESIS AND CLASSIFICATION

Soils of the Prudhoe Bay study area can be arranged concept usually along a drainage gradient from very poorly drained to excessively drained. Very poorly drained soils occur on landforms that exhibit little or no relief differences. Water accumulates in these soils during the spring snow melt and remains during the short growing season as permafrost restricts downward water percolation. Excessively drained soils occur on landforms exhibiting appreciable relief differences and that have relatively coarse textures which provide both good external and internal drainage. Along a geographical gradient, as previously noted, the soils of the eastern part of the study area are moderately alkaline and are calcareous whereas equivalent soils of the western part are slightly acid to very strongly acid.

Soils of the Drained Lake Basins

These level soils are forming in elliptical thaw lake basins that have been drained. These landforms initially were similar to the recently drained lake basin that was studied (Appendix, P-16), and were colonized by sedge and other plants following drainage. These topographically depressed sites are constantly saturated (peraquic moisture regime). The combination of anaerobic conditions that result from a high water table and low soil temperatures inhibits organic matter decomposition, and the successive layers of plant remains that accumulate over time are well preserved.

Typically throughout the study area, these very poorly drained soils exhibit horizons of fibrous sedge material that usually overlie organic rich silt or some kind of organic soil material (usually sapric material) that constitutes the remainder of the active layer. This material usually extends into the permafrost. The fibrous sedge peat is considered to result from pedologic processes whereas the underlying organic rich sediment is thought to result from limnologic processes related to the thaw lake cycle.

A typical pedon forming in a drained lake basin in the eastern part of the study area has been described and sampled (Appendix, P-3; p.90 ; Figs. 4 and 12). This soil (P-3) is characterized by having a water table at the surface, a shallow thaw depth and a highly fibrous, calcareous sedge horizon that is 8.4 percent organic carbon (by weight). This sedge horizon overlies lacustrine sediment which extends below the permafrost table. Since the organic carbon content (on weight basis) of this pedon has been reduced by mineral dilution (loess deposition), it is classified at the subgroup level as a Histic Pergelic Cryaquept. A pedon from a drained lake basin situated further west in the study area would exhibit higher organic carbon content and corresponding lower $CaCO_3$ equivalent and would probably be classified as a Pergelic Cryofibrist.

Figure 12: In the eastern part of this area, a Histic Pergelic Cryaquept is subject to loess deposition. The surface horizon of fibrous sedge has a low organic carbon content. (Appendix, P-3, p. 90).

Figure 13. Subject to little loess deposition in the western part of the area, the surface horizon of the Pergelic Cryofibrist (Appendix, P-19F, p.120) has 14 percent more organic carbon than does the soil of site P-3.

Soils of Aligned Ridge (Strangmoor) Terrain

Aligned ridge terrain, commonly known as strangmoor, develops in drained lake basins. This landform is comprised of basin flats and aligned ridges. These ridges are generally aligned parallel to edges of bodies of water or perpendicular to the hydrologic gradient.

Soils occurring in the basin flats are similar to soils forming in nonpatterned drained lake basins. These soils are also characterized by peraquic moisture regimes, shallow active layers and highly fibrous surficial sedge horizons. Two typical pedons forming in flat landscape positions of aligned ridge terrain were described and sampled (Appendix, P-8F, p.100 , and P-19F, p. 120 ; Fig. 13). Both pedons exhibited similar surface fibrous sedge horizons. In each case, the pedon overlies mineral strata and organic strata. Site P-8F was underlain with sapric material while P-19F was underlain with fibric material. The difference between the two kinds of organic soil material is probably related to site location with respect to the distribution of fibric, hemic and sapric materials that were deposited in the lake basin as a result of the thaw lake cycle (see p.17). If this difference can be expected to occur in the entire area, then it could be theorized that the relative location of a pedon within a former lake basin determines the nature of the lake sediment constituting the lower portion of that pedon. Therefore, within any given drained lake basin, organic soil material ranging from fibric to sapric may be encountered and may affect soil classification if it is of sufficient thickness as to be the dominant kind of organic soil material of the control section.

Complex geomorphic processes, however, eventually cause the obliteration of the lake basin. Because this occurs, the distribution of these fibric, hemic and sapric materials is difficult to accurately predict even though the materials can be expected to occur in the area. The occurrence and distribution of the materials, then, become "random" variables.

In the case of P-8F, the sapric material was not of sufficient thickness to dominate the control section so the pedon is classified at the subgroup level as a Pergelic Cryofibrist, similar to P-19F. It is conceivable that sapric material deposited in a thaw lake basin could be of sufficient thickness such that the pedon would be classified at the suborder level as a Saprist instead of a Fibrist.

A typical pedon forming in a ridge element has been described and sampled (Appendix, P-8R, p. 101). This soil is characterized by a horizon of finely divided organic soil material overlying a horizon of fibrous organic sedge. Underlying these horizons is mineral material that extends below the permafrost table.

It appears that the ridges have formed through the vertical displacement of the fibrous sedge horizon. This apparently created aerobic conditions in the upper section of the pedon and facilitated the decomposition of organic matter which transformed initially fibrous material into a highly decomposed or finely divided form.

This horizon of increased decomposition is demarcated by separate, but related, ferric and carbonate banding at the aerobic-anaerobic interface. The evapotranspiration occurring in the ridge element has evidently created a moisture gradient facilitating upward movement of soil solution from the saturated fibrous sedge material into the highly decomposed horizon. As this soil solution (probably with high $Ca(HCO_3)_2$ and Fe^{+2} contents) migrates upward into the aerobic zone, the moisture is withdrawn by evapotranspiration, oxidizing the ferrous (Fe^{+2}) iron to the ferric form (Fe^{+3}) and precipitating carbonates all along the aerobic-anaerobic interface.

The lack of underlying sapric material similar to that in P-8F is probably related to horizontal variation in thaw lake sediment and organic matter dilution by addition of mineral material during displacement. Because of the lack of organic soil material in the lower section, the pedon is classified at the subgroup level as a Histic Pergelic Cryaquept. Ridge elements were calculated to occupy from 18 to 32 percent (average of 25 percent) of this area mapped as aligned ridge terrain. Pergelic Cryofibrists occupy the remaining area.

Soils of Low Center Polygonal Terrain

Ice wedge formation in permafrost produces polygonal patterned ground. These wedges form below thermal contraction cracks in the active layer. Annually, water percolates down through these cracks in early summer and feeds the ice wedges, causing them to expand. These ice wedges are zones of weakness where the processes of wedge fracture, infilling and expansion are annually recurrent upon freezing (Lachenbruch, 1960b). Volumetric increase in the ice wedges creates cryostatic pressures that elevate the overburden along the wedges thus forming the rim elements of low center polygons. The intersection of these rim elements creates the network of low center polygonal terrain (Fig. 14). Based on surface morphology, low center polygons commonly appear to be nonorthogonal, although some others are either random or oriented orthogonal. The dominance of nonorthogonal systems over broad areas may indicate uniform cooling of a relatively homogenous and nonplastic material (Lachenbruch, 1960a; 1960b).

As previously noted, a low center polygon consists of rim, trough and center elements. Center elements often exhibit hummocks. Polygons vary in size. The proportion of areal extent of each element also varies. Polygonal area calculated for seven sample sites situated throughout the study area from the same map unit averaged 198 m^2 and ranged from 120 m^2 to 273 m^2 (Appendix, P-2, 5, 6, 17 and 20; PBR 28A-034, 29-042). Proportions of center, rim and trough elements averaged 61, 32, and 7 percent, respectively. The percentage of center elements ranged from 48 to 72; rim elements ranged from 20 to 47 percent and trough elements ranged from 4 to 10 percent.

Figure 14. Well developed low center polygonal terrain in the Prudhoe Bay study area. Polygons consist of center, rim and trough elements. The average area of the polygons studied at Prudhoe Bay was 198 m^2.

Typical pedons forming in the elements of low center polygons were described and sampled (Appendix, P-2, 5, 7, 17 and 20; PBR-28A-034, 29-042).

These poorly drained soils usually exhibit aquic moisture regimes and surficial horizons of relatively fibrous sedge material that usually overlie organic and mineral rich thaw lake sediments, similar to the very poorly drained soils of the drained lake basins. Compared to the very poorly drained soils of drained lake basins, however, the poorly drained soils of low center polygonal terrain are more subject to water table fluctuations and slightly better aeration. Consequently, the surficial sedge horizons of soils with aquic moisture regimes are usually somewhat thinner and darker, and are more highly decomposed than are comparable horizons of the soils with peraquic moisture regimes. These differences are probably related to primary and secondary subsidence occurring in soils with fluctuating water tables and aquic moisture regimes. Additional subsidence occurs in the surface horizons of better expressed rim elements of low center polygons. This was previously discussed with respect to ridge elements of aligned ridge terrain.

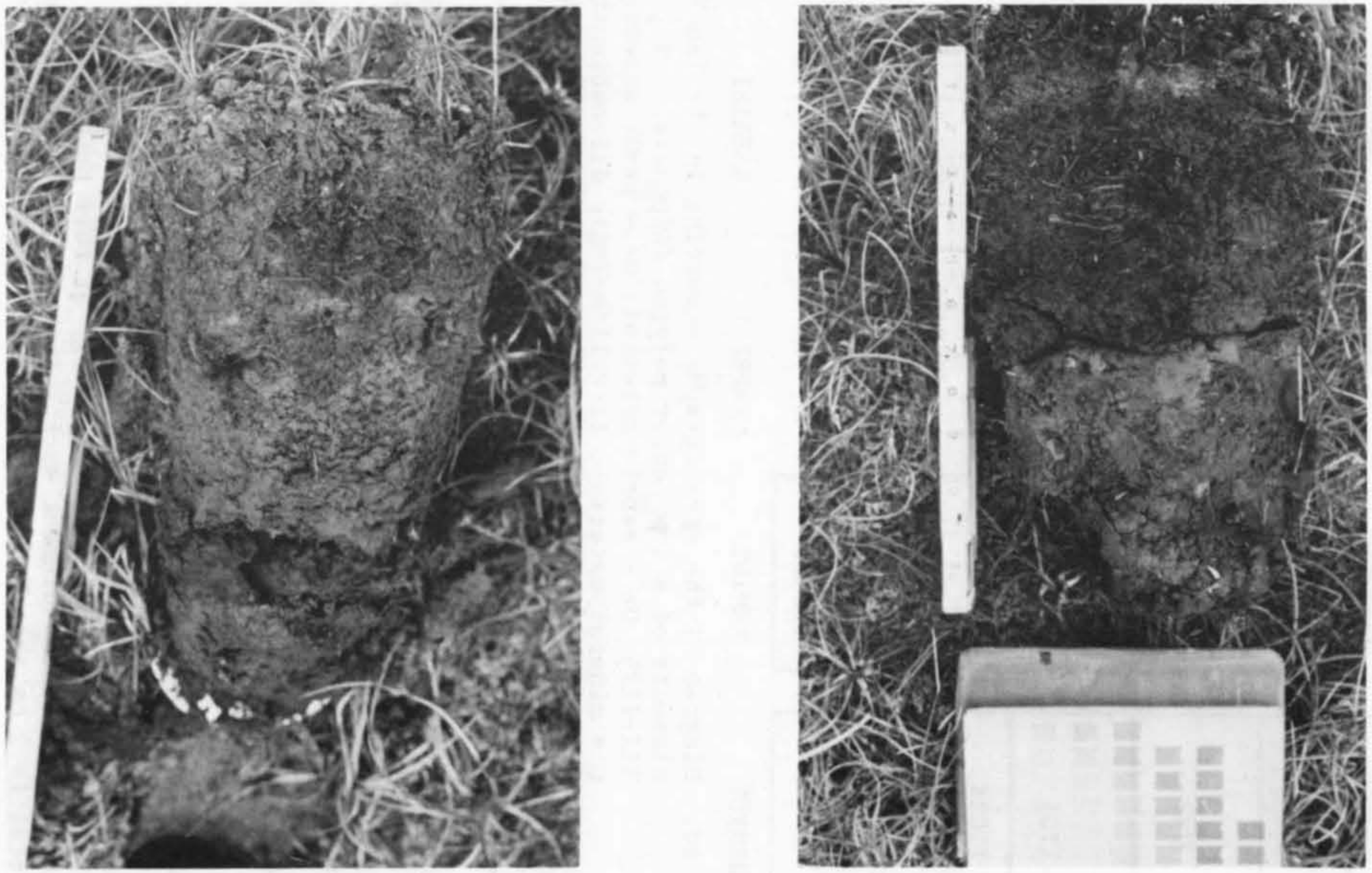
The hypothesis of differential loess deposition was partially inferred from the results of regional correlation of these sample sites. As previously mentioned, an inverse relationship of organic carbon and $CaCO_3$ equivalent was determined to exist between the center elements of these sites.

This dilution significantly affects soil classification, if not morphology, on a regional scale. For example, the center element (P-2C) of site P-2 is classified at the subgroup level as a Histic Pergelic Cryaquept while the rim element (P-2R) is classified as a Pergelic Cryosaprist. Generally, the center element exhibited a relatively low organic carbon content and a high $CaCO_3$ equivalent which is just the reverse of the rim element. The carbonates of the surficial organic horizon of the rim may be leached to the IICl horizon where its $CaCO_3$ equivalent increases. This leaching of mineral material may also increase the organic carbon content of the overlying Oal and Oa2 horizons, thus qualifying it as organic soil material.

These two pedons, occurring within the same polygon, also exhibit significant variation with depth. The thaw lake sediment constituting the lower section of P-2R consisted of both hemic and sapric material whereas that of P-2C, located about 10 m away, was comprised of organic rich silt loam. These differences may be due to the relative location of the two pedons within an indiscernable old drained lake basin with respect to the natural variation of thaw lake sediment, as was previously discussed.

Equivalent soils further west and north exhibited progressively higher organic carbon values and lower $CaCO_3$ equivalent, supporting the concept of differential loess deposition. Sample site P-17 serves to illustrate (Appendix, P-17, p. 112; Figs. 4, 15 and 16). The surficial sedge horizons of the center element (P-17C) qualify as organic soil material and are classified as hemic material. In this pedon (P-17C), hemic material is the dominant kind, constituting 23 cm of the control section while sapric material (thaw lake sediment) comprises 18 cm. Therefore, the pedon is classified at the subgroup level as a Pergelic Cryohemist. The hummock element (P-17H) is also classified as a Pergelic Cryohemist since the thickness of hemic material (26 cm) formed from pedologic processes is greater than that of sapric material (18 cm observed, 25 cm possible maximum) that resulted from limnologic processes.

In the two remaining rim and trough elements of this low center polygon, the thickness of the lake deposited sapric material exceeded the thickness of the hemic sedge material. This resulted in a transition from a Hemist to a Saprist classification. The dominance of sapric material in the control section of the rim element resulted partly from the subsidence of the upper few centimeters of the surficial sedge horizon which converted hemic material to sapric material. At the contact between surficial sapric and hemic material, the characteristic ferric iron and carbonate banding occurs. The genesis



a b

Figure 15. (a) Pergelic Cryohemist (Appendix, P-17C, p. 115) forming in the center element.
(b) Pergelic Cryosaprist (Appendix, P-17R, p. 113) forming in the rim element.
Note the carbonate and iron banding in the rim soil.

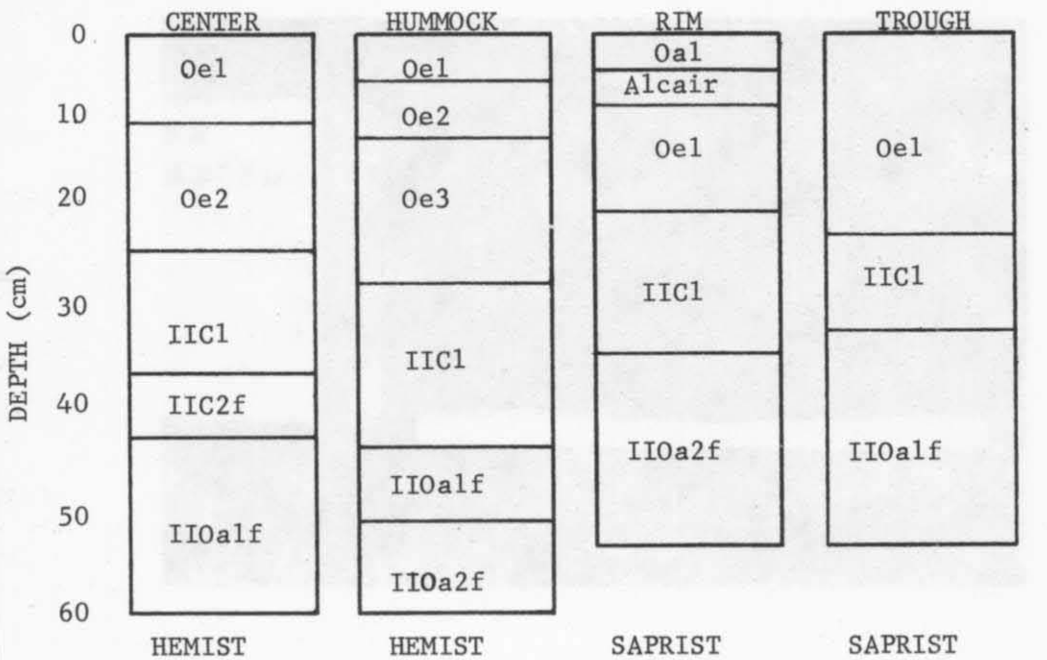


Figure 16. Diagram of the stratigraphy occurring in the landform elements of a low center polygon (Appendix, P-17, pp. 112-117). Oa = sapric material; Oe = hemic material; C = mineral material; II = lithologic discontinuity (thaw lake sediment); Alcair = zone of carbonate and iron accumulation.

of this horizon was previously discussed with respect to aligned ridge terrain. The organic carbon content of this horizon was 11.9 percent, failing to qualify as organic soil material. Evidently, the translocation of iron and carbonates into the thin Alcair horizon has significantly diluted the organic carbon content of that horizon. The rim element pedon is classified at the subgroup level as a Pergelic Cryosaprist.

The trough element of this low center polygon (P-17T) is also classified at the subgroup level as a Pergelic Cryosaprist because sapric material constitutes 25 cm of the control section while hemic material constitutes only 20 cm. The morphology of this pedon is similar to that of the center element except that the surface horizon of hemic material is 3 cm thinner, and there is some variation in the lake sediment constituting the lower section of the two pedons.

Considering the observed variation in thaw lake sediment, it is conceivable that the center and hummock elements, P-17C and 17H, respectively, would have been classified at the suborder level as Saprists if the thaw lake sediment that qualified as organic rich mineral soil material exhibited just slightly higher organic carbon contents. For example, if the organic rich loam horizon of P-17C exhibited just 2 percent more organic carbon, the cumulative thickness of sapric materials in the control section would have exceeded that of the hemic material 31 cm to 23 cm, respectively.

Sample site P-20 (Appendix, P-20, p.121 ; Fig. 4) is comprised of center, rim and trough elements that are all classified at the subgroup level as Pergelic Cryosaprists. The center and trough elements (P-20C, 20T) are characterized by 20 cm of hemic material underlain by 21 cm of sapric material. The rim element consists of a surficial sapric horizon overlying a hemic horizon which, in turn, is underlain by sapric thaw lake sediment. Cumulative sapric thickness in the rim element equalled 29 cm to 12 cm of hemic material thickness.

Under the present classification criteria, the highly variable and unpredictable nature and distribution of thaw lake sediment constituting the lower sections of pedons within the same immediate area or landform reduces the taxonomic purity of the map unit, making the accurate delineation of polypedons impractical.

Soils of Slightly Convex Polygonal Terrain

Slightly convex polygonal terrain is a patterned ground type that exhibits slightly better drainage than low center polygonal ground, although the soils still have an aquic moisture regime.

A typical slightly convex polygon consists of a center element and a trough element (Fig. 17). The center element, in turn, is comprised of hummock and interhummock elements. The polygons vary somewhat in size along with the areal extent of each element. Polygonal area calculated for two sample sites in the study area from the same map unit averaged about 62 m^2 and ranged from 60 m^2 to 63 m^2 (Appendix, P-1, p. 85 ; PBR 28-037, p.73). Area of center elements for the two polygons equalled 58 m^2 and 57 m^2 and occupied from 97 percent to 90 percent of the entire polygon, respectively. Area of trough elements for the two polygons equalled 2 m^2 and 6 m^2 and occupied from 3 percent to 10 percent of the entire polygon, respectively.

The elements of one typical slightly convex polygon have been described and sampled (Appendix, P-1, p. 85 ; Figs. 17 and 18). The center element soils (P-1H; 1IH) of this sample site exhibit relatively thick mollic epipedons that extend well below the permafrost table to

Figure 17. Well developed slightly convex polygonal terrain in the Prudhoe Bay study area. Polygons consist of center and trough elements. The area of this polygon (Appendix, P-1, pp.85-87)is 60 m^2 with about 3 percent of this area being occupied by troughs.

depths of about 60 cm and constitute the entire thickness of the control section. These pedons are classified at the subgroup level as Pergelic Cryaquolls.

The upper section of the mollic epipedons of the center element soils of slightly convex polygons may have resulted from the oxidation of mineral rich sedge peat that formed over thaw lake sediment--a genetic process initially inferred from the morphology of uplifted ridge and rim element soils. The lower section of the mollic epipedon probably was deposited during the lake stage of the thaw lake cycle.

The trough element soil (Appendix, P-1T, p. 87 ; Fig. 18b) of site P-1 is characterized by a wedge shaped mass of hemic moss and sedge material ranging in thickness from 13 to 18 cm that is underlain by organic rich silt loam. Peat accumulation over the ice wedge appears to be the significant genetic process within the active layer of the trough element as the permafrost table above the ice wedge is at the hemic-silt loam contact. The underlying organic rich silt loam probably was deposited during the lake stage of the thaw lake cycle. This soil is classified at the subgroup level as a Histic Pergelic Cryaquept.

a b

Figure 18. (a) Pergelic Cryaquoll (Appendix, P-1H, p. 86) occupies an earth hummock position of the center element of a slightly convex polygon. (b) Histic Pergelic Cryaquept forming in a trough element. Note the small ice wedge (bottom center). (Appendix, P-1T, p. 87)

A second center element soil of a slightly convex polygon was described and sampled (Appendix, PBR 28-037, p. 73 ; Fig. 4). This soil was characterized by a mollic epipedon overlying strata of finely divided organic matter (24.2 percent organic carbon) that extended below the permafrost table and gleyed loamy sand.

The genesis of this soil is considered similar to the center element soils of site P-1. The mollic epipedon, again, may have resulted from the oxidation of mineral rich sedge peat. The lower section of the pedon comprising finely divided organic matter was probably deposited during the lake stage of the thaw lake cycle. The gleyed loamy sand substratum is probably the upper section of the Gubik Formation. This soil is also classified at the subgroup level as a Pergelic Cryaquoll.

Soils of Frost Boil Terrain

Another type of patterned ground occurring within the Prudhoe Bay study area is nonsorted circle or frost boil terrain (Fig. 19).

Figure 19. Nonsorted circle (frost boil) almost devoid of vegetative cover due to severe cryoturbation or frost churning.

The formation of frost boils is another example of cryoturbic activity in the form of frost churning. Soils of this landform consist of two basic elements: (1) undisturbed soil, and (2) frost churned soil of frost boils that cyclically occur across the landscape at relatively constant intervals of several meters.

This landform is characterized by roughly circular mineral eruptions (frost boils) at the surface. Denuded of any vegetation which would insulate and stabilize the underlying soil material, the material comprising the frost boil is subject to deeper summer thaw and faster subsequent winter freeze-up than the surrounding undisturbed soils. Volume increase of frost boil material upon freeze-up creates internal pressures causing extrusion of frost boil material into the adjacent soils. Frost churning then redistributes surficial material throughout the soil.

Two typical elements from nonsorted frost boil terrain, a hummock element and a frost boil element about 1.5 m apart were described and sampled (Appendix, PBR 24-036M; 24-036F; pp. 71-72; Fig. 20).

The soil forming in the frost boil (PBR 24-036F) is characterized by about 35 cm of olive gray loam overlying a substratum of organic rich silt loam that extended about 25 cm below the permafrost table. The gleyed color of the solum suggests reducing conditions associated with an aquic moisture regime. The occurrence of high chroma mottles within the gleyed part of the solum also suggests some low degree of chemical alteration--mainly the concentration and oxidation of iron compounds. These morphological features were interpreted to infer the existence of a weakly developed cambic horizon within the soil of the frost boil element. The organic rich silt loam substratum may be partly involuted mollic epipedon material from the surface and partly thaw lake sediment, or it may be entirely thaw lake sediment. The soil of the frost boil element is classified at the subgroup level as a Pergelic Cryaquept.

The soil forming in the relatively undisturbed area adjacent to the frost boil (PBR 24-036M) is characterized by a mollic epipedon underlain by a thin stratum of gleyed loam that, chemically and morphologically, is relatively similar to the gleyed horizon of the frost boil. This stratum appears to represent the initial intrusion of frost boil material into the mollic epipedon as a result of frost churning. This material, in turn, is underlain with organic rich silt loam with substrata of organic rich loam and loamy fine sand that extend below the permafrost table. The organic rich silt loam substratum is considered to be thaw lake sediment. The genesis of the upper section of the mollic epipedon is considered to have formed, at least in part, through the oxidation of mineral rich sedge peat, as was previously discussed in relation to ridge and rim elements and slightly convex polygons. The soil of the hummock element is classified at the subgroup level as a Pergelic Cryaquoll.

Figure 20. A complex of Pergelic Cryaquolls (left) and Pergelic Cryaquepts (right) occurring in the frost boil terrain.

The extent of frost churning and subsequent mollic epipedon truncation of the soils of frost boil terrain was studied along a 1.5 m transect that extended from a frost boil element to a hummock element. This transect revealed that frost churning had significantly truncated the mollic epipedon along 80 percent of the 1.5 m length (Everett and Parkinson, 1977). In this virgin condition, 80 percent of the pedons along this transect would be classified at the subgroup level as Pergelic Cryaquepts and the remaining 20 percent as Pergelic Cryaquolls. If classified on the basis of hypothetical mixing of the upper 18 cm, as is permitted in <u>Soil Taxonomy</u> (Soil Survey Staff, 1975), just over 50 percent of the pedons along this transect would be classified as Pergelic Cryaquolls with less than half being classified as Pergelic

Cryaquepts. The proportion of Inceptisols to Mollisols would, over time, increase with increased frost churning and subsequent mollic epipedon truncation.

The close proximity of the frost boil elements and hummock elements is within the established limits of the expanded pedon as defined in Soil Taxonomy (Soil Survey Staff, 1975). Both elements could be considered as the same soil as they are genetically related, but no single established taxon presently exists which is appropriate. Using established taxa, therefore, this landform is presently considered to consist of a complex of Pergelic Cryaquolls and Pergelic Cryaquepts. Potential taxa utilizing the expanded pedon concept will be considered under classification alternatives.

Soils of High Center Polygonal Terrain

High center polygonal terrain is another type of patterned ground, similar to slightly convex polygonal terrain. However, the center element is markedly elevated relative to the trough element (Fig. 21).

Figure 21. Well developed high center polygonal terrain in the Prudhoe Bay study area. Polygons consist of center elements and trough elements. Spade is standing in trough and is approximately 1 m in length.

These polygons may have developed from flat-top ice wedge polygons or low center polygons whose ice wedges have melted and whose rims have eroded.

Two typical pedons from a high center polygon, a center element and a trough element, were described and sampled (Appendix, P-15, p. 104, Figs. 4, 21 and 22). Polygonal area was calculated to equal 19 m^2 with the center element occupying 84 percent of the total area and the trough element occupying the remaining 16 percent.

Figure 22. Pergelic Cryosaprist forming in the center element of a high center polygon (Appendix, P-15IH, p. 104).

The soil forming in the center element is characterized by about 50 cm of sapric material, about half of which extends below the permafrost table. Since high center polygons are formed by the melting of surrounding ice wedges or possibly by physical displacement (rim coalescence) by expanding ice wedges, it is inferred that the center element soil has evolved from a low center polygon-center element soil. The upper section of the sapric material of site P15IH may have formed from the decomposition of the uplifted hemic sedge material as a result of improved soil drainage. The lower organic section of the solum may consist of thaw lake sediment. This pedon (P-15IH) is classified at the subgroup level as a Pergelic Cryosaprist. A few pedons of high center polygons exhibit hemic sedge material that underlies sapric material. The hemic-sapric contact is usually demarcated by ferric banding similar to that observed and described in relation to aligned ridge and polygon rims.

The trough element (P-15T) is characterized by an active layer comprised of moss and sedge peat underlain by frozen organic rich silt loam. The primary soil forming process occurring in the trough element appears to be net peat accumulation. This pedon is provisionally classified at the subgroup level as a Histic Pergelic Cryaquept, provided that the permafrost sediment from 25 to 41 cm would qualify as mineral instead of organic soil material.

Soils of Earth Hummock Terrain

The soils of earth hummock terrain are among the best drained soils of the study area. Earth hummocks occur on pingos and dissection slopes that are parallel to streams.

Pingos are mounds that form in drained lake basins as a result of forces generated by freezing water (Fig. 23). As freezing of thaw lake sediments occurs upon lake drainage, water is segregated between converging freezing fronts. The water eventually freezes, and the increase in volume creates forces which elevate or vertically displace overburden, thus creating a small mound (Brown and Sellmann, 1973). From a study of Mackenzie River Delta pingos, Mackay (1962) concluded that pingo growth was relatively slow "probably involving tens of years for the larger pingos." In quantifying growth rates, Mackay (1972) studied three pingos forming in separate lake basins that drained in 1950. About twenty years after drainage, the center pingo was about 5.5 m in elevation and was still growing.

Two typical pedons forming in different pingos have been described and sampled (Appendix, P-22, p. 124 ; PBR-50, p. 69). Site P-22 was located in well developed earth hummock terrain on the pingo side slope, and the pedon was comprised of a hummock element and an interhummock element (Fig. 24). Site PBR-50 was located at the summit of the pingo where the earth hummocks have been largely eroded.

These soils forming in pingos exhibit calcareous mollic epipedons that overlie stratified calcareous sand and gravel. Since pingos

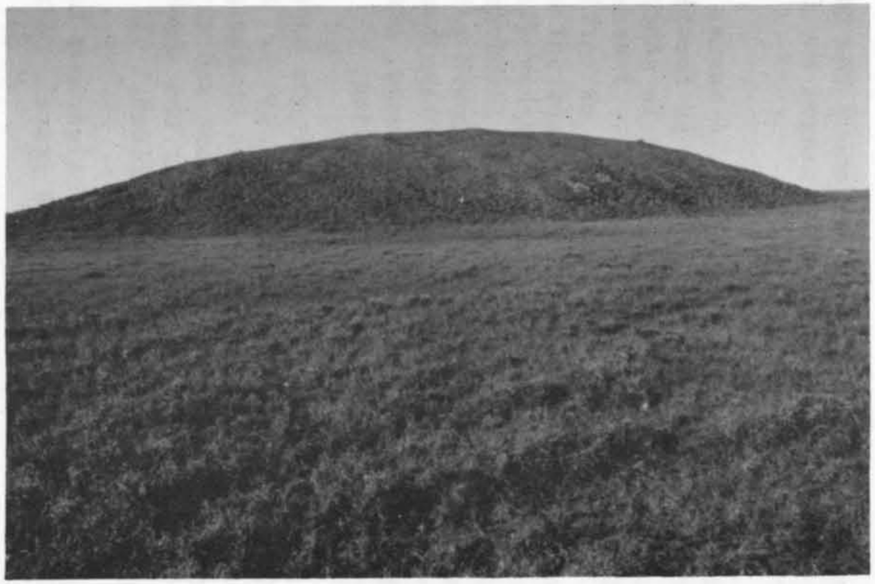


Figure 23. Pingos are of minor extent in the Prudhoe Bay study area, occupying less than 1 percent of the total area.

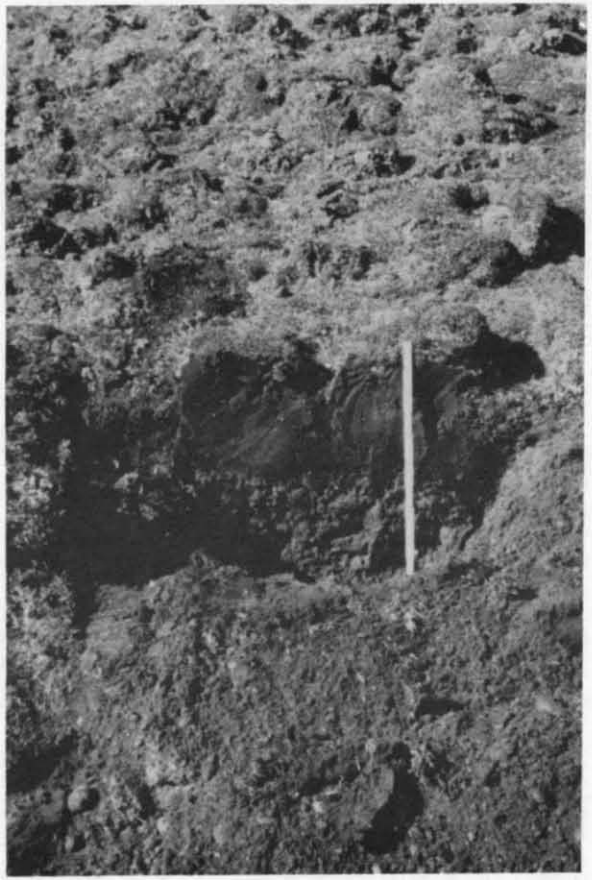


Figure 24. Pergelic Cryoboroll forming in earth hummock terrain that developed on a pingo. (Appendix, P-22, p. 124).

develop in drained lake basins, it is concluded that the mollic epipedons have primarily developed from the organic and silt rich lacustrine deposits related to the thaw lake cycle. Uplift probably occurred before substantial amounts of sedge peat could accumulate under anaerobic conditions.

As previously noted, organic carbon content for organic rich thaw lake sediment averaged 13.4 percent and ranged from 2.4 to 29.5 percent. The organic carbon values of the mollic epipedons of these two sample sites averaged 9.2 percent and ranged from 8.7 to 11.3 percent, approaching the lower organic carbon limit used for defining organic soil material. In some pedons these organic and mineral rich surface horizons may qualify as organic soil material by exceeding the maximum organic carbon content defined for mineral soil material.

The thickness of the mollic epipedon is probably determined by: (1) the initial thickness of organic and silt rich thaw lake sediment originally deposited and (2) the degree of erosion. Mollic epipedon thickness of pingo soils observed throughout the study area ranged from 18 to 60 cm.

Other prominent morphological features of soils forming in pingos include: (1) free nodular carbonates in the mollic epipedons and carbonate coatings on the undersides of gravel; and (2) silt coatings on upper sides of the same coarse fragments. This possibly suggests two distinct periods associated with soil moisture. The first period of excess moisture may involve the downward leaching of soluble carbonates and translocation of silt particles in suspension. This translocation may be terminated during the second period of moisture deficit. As the soil becomes dessicated, soluble carbonates are precipitated.

Calcic horizons (i.e. horizons of secondary carbonate accumulation) are recognized to have developed in these soils. Site P-22 generally exhibited higher $CaCO_3$ equivalent than did PBR-50. This is probably the result of the location of each pingo and subsequent differential calcareous loess deposition (Fig. 4). These soils are classified at the subgroup level as Pergelic Cryoborolls, although calcic horizons are not currently recognized within this subgroup.

Soils forming in dissection slopes are morphologically similar to soils forming in pingos. These soils exhibit mollic epipedons that overlie coarse textured material. As streams meander, cutting into the adjacent uplands, organic and silt rich thaw lake sediment is exposed. The mollic epipedons of these soils may have resulted from this exposure. Significant variation in the organic carbon content of the mollic epipedons may be expected, as in pingos, due to the variation in thaw lake sediment. In some places, these organic and mineral rich surface horizons may also qualify as organic soil material by exceeding the maximum organic carbon content defined for mineral soil material.

A typical pedon forming in a dissection slope in the western part of the study area was described and sampled (Appendix, P-18, pp. 118-119). The site was located in well developed earth hummock terrain. The pedon was comprised of a hummock element and an inter-hummock element.

This soil (P-18) exhibited a mollic epipedon overlying stratified calcareous fine sandy loam, gravelly loamy sand and gravelly sand. The organic carbon content of the surface horizon was 14.4 percent, slightly exceeding the maximum limit defined for mineral soil material. This marginal organic carbon value is not considered by this author to be significant enough to alter classification. Practicality dictates its recognition as a mollic epipedon even though it technically fails to qualify as mineral soil material. As previously noted, lake sediments having organic carbon values in excess of the critical limit defined for mineral soil material are thought to be relatively common. This is inferred from the fact that organic carbon content of 42 thaw lake sediment samples scattered throughout the study area averaged 13.4 percent and ranged from 2.4 to 29.5 percent.

The material underlying the mollic epipedon exhibited evidence of translocation of silt and, to a lesser extent, calcite. A calcic horizon has developed in this soil, although it is not as well expressed as in the excessively drained soils of pingos. This may be due to the remote location of the pedon with respect to the source of carbonate rich loess. The pedon is classified at the subgroup level as a Pergelic Cryoboroll.

Soils of Flood Plains and Sand Dunes

Flood plains and sand dunes are nonpatterned landforms in the study area. Both are similar in that they are relatively recent geologic features. The soils of either landform exhibit little development. Generally, these relatively well drained soils are calcareous and have relatively thick active layers.

Nearly level alluvial soils exist mainly along the Sagavanirktok and Kuparuk Rivers and, to a lesser extent, along the Putuligayuk River. The landforms are subject to seasonal flooding and sediment deposition. As was previously noted, the limestone bedrock along much of the headwaters of the Sagavanirktok River in the Brooks Range helps provide a calcareous sediment load for river transport. The alluvium of the Kuparuk River is also calcareous.

A typical pedon forming in the flood plain of the Sagavanirktok River was described and sampled (Appendix, P-14, p. 103). This calcareous soil exhibited highly stratified lenses of very fine sandy loam, silt loam, and fine and medium sand overlying very gravelly coarse sand. Some mottling in the upper part of the pedon may indicate periods of seasonal saturation, probably of short duration. This soil is classified at the subgroup level as a Pergelic Cryorthent.

The coarse-textured soils of the major flood plains provide good potential as a source of aggregate material for construction. The aggregate material used in construction of a drilling pad located in the eastern part of the study area was described and sampled for characterization purposes (Appendix, P-6, p. 96). The very gravelly coarse sand aggregate of site P-6 correlated closely to the coarse-textured IIIC4 and IIIC5f horizons of the alluvial soil, site P-14.

Figure 25. Longitudinal sand dunes on leeward side of the Sagavanirktok River delta.

The fine to very fine sand fraction (0.25 to 0.05 mm) is highly subject to wind transport, providing sediment to the triangular shaped sand dune fields that exist along the leeward side of the Sagavanirktok River estuarine delta. The soils of the dune fields are calcareous. Little pedogenic alteration has occurred in these soils, primarily due to the ephemeral nature of the sand dunes, the consequent lack of time for soil formation to occur, and the coarse texture of the soils.

A typical pedon forming in an active longitudinal sand dune was described and sampled (Appendix, P-9, p. 102; Figs. 25 and 26). Generally, the excessively drained soil (P-9 was relatively uniform with depth and exhibited a relatively thick active layer due to the sandy texture and the sparse vegetation cover. The $CaCO_3$ equivalent of the fine sand horizons of the sand dune pedon correlated with the finer grained alluvium that is subject to wind transport. No evidence of secondary carbonate accumulation was found as was present in soils of other, more stable landforms such as pingos. The pedon is classified at the subgroup level as a Pergelic Cryopsamment.

Figure 26. Pergelic Cryopsamment occurring in a sand dune. These sparsely vegetated soils exhibit little development due to coarse textured material and ephemeral nature of the sand dune (P-9, p. 102).

CLASSIFICATION MODIFICATION

In testing the classification of the Prudhoe Bay area soils using Soil Taxonomy, several ideas on revisions were developed which, if adopted, could lead to further refinement in the classification of cold region soils. Some changes are of a minor nature involving, for example: (1) the inclusion of a certain property within a given taxon; or (2) the establishment of a new taxon. Such proposals involve soils of slightly convex polygons, frost boil terrain and earth hummocks. Other suggestions would involve major changes regarding (3) the selection of classification criteria; (4) the categorical level at which they occur; and (5) also involve redefining, in certain cases, the pedon itself.

Classification of Soil of Slightly Convex Polygons

Soils of slightly convex polygons, as previously noted, exhibit relatively thick mollic epipedons. The Cryaquolls of site P-1 had mollic epipedons of about 60 cm thick (Appendix, P-1H, 1IH, pp. 85 and 86) exceeding the maximum specified thickness of 50 cm currently defined for the Pergelic Cryaquoll taxon (Soil Survey Staff, 1975). This could be corrected either: (1) by redefining the mollic epipedon thickness for Pergelic Cryaquolls to include overthickened mollic epipedons; or (2) by establishing a new taxon of Cumulic Pergelic Cryaquolls to recognize the overthickened mollic epipedons (i.e. those mollic epipedons 50 cm or more thick). The establishment of a cumulic subgroup appears to be the more appropriate choice, assuming these soils are of sufficient areal extent.

The Cryaquoll of site PBR 28-037 exhibited a substratum of organic soil material below the mollic epipedon which is thought to represent a part of the variation occurring in thaw lake sediment (Appendix, PBR-28-037, p.73). The recognition of buried histic epipedons in the taxon of Pergelic Cryaquolls would be an appropriate modification. A taxon of Pergelic Thapto-Histic Cryaquolls could also be established to classify these Cryaquolls that have buried histic epipedons.

Classification of Soils of Frost Boil Terrain

Soils of frost boil terrain include Pergelic Cryaquolls forming in relatively undisturbed hummock elements and Pergelic Cryaquepts forming in and around frost boils which are highly susceptible to frost churning. As previously discussed, frost boil terrain is considered to consist of a complex of Pergelic Cryaquolls and Pergelic Cryaquepts.

Under current definitions as established in Soil Taxonomy (Soil Survey Staff, 1975), the pedon could be expanded to include the half cycle of the hummock element and frost boil element since the full cycle between frost boils averaged 2.5 m (Appendix, frost boil terrain transect, p. 82). A taxon of Pergelic Ruptic Aqueptic Cryaquolls could be established to classify the soils of frost boil terrain that are moderately disturbed by cryoturbation (S. Rieger, personal communication). It is highly conceivable that continued frost churning and subsequent mollic epipdeon truncation over time would inevitably lead to pedons dominantly comprised of Aquepts instead of Aquolls. This suggests the possible need for a taxon of Pergelic Ruptic Aquollic Cryaquepts for adequate classification at the subgroup level of soils that are highly disturbed by cryoturbation.

Classification of Soils of Earth Hummock Terrain

Soils forming in earth hummock terrain, as previously discussed, exhibit calcic horizon development. Generally, the current definition of the Pergelic Cryoboroll taxon does not include a calcic horizon (Soil Survey Staff, 1975). The taxon of Calcic Pergelic Cryoboroll could be established to classify the soils of earth hummock terrain as studied at Prudhoe Bay. It was also noted earlier that mollic epipedon thickness of earth hummock soils observed throughout the study area ranged from 18-60 cm. Since 40 cm of mollic epipedon with a silty texture is the class limit between cumulic and non-cumulic, a taxon of Calcic Cumulic Pergelic Cryoborolls may be appropriate at the subgroup level in classifying these Mollisols with overthickened mollic epipedons. Excessively drained soils having overthickened mollic epipedons and calcic horizons are of very small extent in the study area, probably occupying less than 1 percent of the total area.

Pedon Modification

A pedon is a three dimensional body of soil, roughly polygonal in shape, with an area ranging from 1 to 10 m^2, depending on soil variability (Soil Survey Staff, 1975). The lateral extent of the pedon is large enough (within the specified maximum area of 10 m^2) to represent the nature and variability of horizons that may exist. The depth limit of the pedon "is the somewhat vague limit between the soil and the 'not-soil' below" (Soil Survey Staff, 1975).

Under current definitions, if soil horizon variability is cyclic, recurring at intervals of 2 to 7 m, the pedon would be expanded to include one-half the cycle. If horizons are cyclic at linear intervals greater than 7 m, the pedon occupies an area of about 1 m^2, and each cycle usually consists of more than one soil (Soil Survey Staff, 1975).

Table 4. Outline of minor classification changes suggested for the Prudhoe Bay region.

LANDFORM	CLASSIFICATION	MODIFICATION
slightly convex polygon	Pergelic Cryaquoll	Cumulic Pergelic Cryaquoll or Pergelic Thapto-Histic Cryaquoll
frost boil terrain	Pergelic Cryaquoll-Pergelic Cryaquept complex	Pergelic Ruptic-Aqueptic Cryaquoll
earth hummock terrain	Pergelic Cryoboroll	Calcic Pergelic Cryoboroll

As previously noted, the expanded pedon could be successfully used in classifying soils of frost boil terrain if an appropriate taxon was established, since the landform elements of frost boil terrain are linearly cyclic at intervals of 2.5 m.

In the case of polygonal terrain, where the landscape is comprised of a set of polygons recurring at relatively constant intervals, the cycle would consist of two contiguous polygons. The pedon is by definition roughly polygonal in shape and could be adapted to coincide with the half-cycle (i.e., one of the two contiguous polygons). Soil genesis, morphology and classification are closely related to micro-topographic landform elements comprising the polygon, and the soils comprising these various elements are genetically related (see pp. 40-43). The recognition of a pedon as constituting one polygon would objectively determine the lateral extent of the pedon to adequately represent the nature and variability of any horizons that may exist. This would mean that one taxon, using the concept of a ruptic pedon, could be used to classify all the soils of the landform elements instead of recognizing a complex of two or more taxa.

As previously noted, total area for seven intensively studied low center polygons ranged from 120 to 273 m^2 and averaged 198 m^2. Polygon diameters ranged from 11.1 m to 16.5 m, respectively, and averaged 13.8 m. These intervals for the half-cycle and subsequent polygon areas exceed the maximum values arbitrarily established for the pedon. Increasing the maximum defined interval for the half-cycle by a factor of 5 or 6 (16.5 m or 21.0 m instead of 3.5 m) would enlarge the expanded pedon sufficiently to permit it to coincide with any given polygon observed in the study area. In effect, the areal extent of the soil individual would be determined objectively and not subjectively. Specific examples using this idea will be considered in relation to other suggestions later in this paper.

Thickness of the Control Section

As previously noted, the lower limit of the pedon is that somewhat vague contact between soil and "not-soil" (Soil Survey Staff, 1975). In classifying the soils of the study area, particularly the saturated, highly organic soils, rather rigid depths of the control section exist which usually extend well below the permafrost table. For example, a center element soil classified as a Pergelic Cryohemist (Appendix, P-17C, p. 115) has an active layer 36 cm thick of which 23 cm is hemic material formed in situ. Generally, a soil is considered a Histosol if half or more of the upper 80 cm is comprised of organic soil material (Soil Survey Staff, 1975). This criterion necessitates the examination of at least the upper few decimeters of permafrost that, as has been demonstrated, is comprised of highly variable thaw lake sediment. The dominant kind of organic soil material of the control section determines its placement at the suborder level.

As previously mentioned, the control section of the center element soil (P-17C) of site P-17 was composed of 23 cm of hemic material (formed by pedologic processes) overlying 18 cm of sapric material (reworked and deposited by limnologic processes). The slight dominance of hemic material over sapric material in the control section classifies the soil at the suborder level as a Hemist instead of a Saprist. If the organic rich IIC horizons had just several percent more organic carbon content, that material would be classified as sapric material whose added thickness would require the soil to be classified as a Saprist instead of a Hemist. Such is the case with the center element soil of site P-20C (classified as a Pergelic Cryosaprist) where the control section is dominated by reworked and lake deposited sapric material over hemic sedge material.

The genesis of center element soils of sites P-17 and P-20 is essentially the same, but the former is classified as a Hemist and the latter is a Saprist.

Apart from the considerable impact that the highly variable organic rich perennially frozen sediment has on soil classification at high categorical levels is the problem of inaccessibility that the field worker faces--particularly in soils that have a peraquic moisture regime where the water table is at or above the surface. This factor precludes examination and sampling of the frozen parts of many control sections and, hence, precludes the precise classification of the soils. These factors are strong arguments for the redefinition of the control section in permafrost areas.

It has been suggested that in classifying Histosols with a mean soil temperature of $0^{o}C$ or less, the permafrost contact could be treated similarly to that of a lithic contact (Everett and Holowaychuk, personal communications). This would mean that the soil would be classified based only on the properties of the active layer. Under these conditions, the lower limit of the pedon would terminate at the maximum depth of seasonal thaw which usually occurs by early to mid August (Drew, and others, 1958). This would serve as a more objective determination of the contact between soil and "not-soil." When considering the general inaccessibility and unpredictable nature of the perennially frozen sediment in the study area, it seems desirable to classify and map soils based on accessible and measurable properties that are more easily observed and are more precisely predicted. The pedon's lower limit could be determined by the contact between the zone of maximum seasonal thaw and the permafrost. If this criterion was established, it would satisfy both the accessibility and predictability requisites. Tradeoffs or disadvantages of this idea include potential inconsistency between field workers in subjectively estimating total depth of seasonal thaw and variation in total seasonal thaw depths from year to year.

Recognition of Soil Temperature Regime at Higher Categorical Levels

The pergelic soil temperature regime has important accessory characteristics that include the thaw lake cycle, patterned ground formation, reduced biological and chemical activity and impeded soil drainage. These processes significantly affect soil genesis, morphology and classification. In addition, the nature of the permafrost is one of the most significant features of the landscape influencing soil capability or engineering design (Ferrians and others, 1969; Mackay, 1972; McVee, 1973).

For cold region soils, temperature regime has more accessory characteristics than does moisture regime. Therefore, it seems appropriate to recognize the pergelic temperature regime at a higher categorical level. This idea conforms somewhat to a recently proposed tentative addition to the Canadian classification system of the Cryosolic Order. This order was tentatively proposed to classify all soils which have permafrost within 1 m of the surface into the same order (Day and Lajoie, 1973).

Presently, differentiating criteria for most soils at the suborder level in Soil Taxonomy (Soil Survey Staff, 1975) include soil moisture regime for mineral soils and dominant kind of organic soil material for organic soils. Temperature regime is considered at both the great group level (cryic) and also at the subgroup level (pergelic) for both mineral and organic soils. In the case of excessively drained Mollisols or Pergelic Cryoborolls, soil temperature regime is recognized at three categorical levels of the suborder, great group and subgroup.

In light of the importance of temperature regime to the genesis, morphology, classification and use-potential of most soils of the study area, it is suggested that, in these instances, the pergelic temperature regime be recognized at a relatively high categorical level, specifically the suborder level.

The use of one term to denote temperature regime instead of two or three would eliminate unnecessary or redundant verbiage from the taxon name. This would help improve the organization of knowledge by integrating more soil properties into the taxon name so that these properties could be more easily remembered.

In this paper, the term "gel" (L. gelare, to freeze) (Soil Survey Staff, 1975) will be used to designate the pergelic temperature regime at the suborder level. This term, as used here, will not denote ice content of the permafrost.

Histosols with a pergelic temperature regime could generally be redefined as having horizons of organic soil material constituting half or more of the active layer thickness. The pergelic temperature regime would be recognized at the suborder level, denoted by the formative element "gel" in the taxon name (e.g. "Gelist" denoting these cold Histosols). The dominant type of organic soil material (including fiber characteristics) of the active layer would determine the great group classification. The terms "fib," "hem" and "sap" would denote the dominance of fibric, hemic and sapric material, respectively. The subgroup level would be used to express the degree of conformity or nonconformity of the soil to the central concept of the great group.

Placement at the subgroup level would be based on the presence or absence of mineral material in the active layer. The term "typic" would denote conformity to the central concept of the great group and would be used to indicate an organic soil where the active layer is comprised entirely of a given kind of organic soil material. Nonconformity with the central concept of the great group would be expressed as an intergrade or extragrade subgroup. The term "terric" would indicate, for example, an extragrade subgroup where mineral soil material occurs in the active layer and comprises less than half of the active layer thickness. Classification at the family level would continue to be based on soil reaction class as well as particle size class for terric subgroups. The following classifications are based solely on the horizons of the active layer.

Histosols with a peraquic moisture regime that are dominantly comprised of fibric material would be classified at the great group level as Fibgelists. At the subgroup level, the soils would usually be classified as Terric Fibgelists due to the underlying mineral thaw lake sediment (Appendix, P-8F, p. 100; P-19F, p. 120).

Histosols with an aquic moisture regime that are dominantly comprised of hemic material would generally be classified at the great group level as Hemgelists. Commonly, the active layers of these soils also partially consist of mineral thaw lake sediment. Thus, soils presently classified as Histic Pergelic Cryaquepts, Pergelic Cryohemists, and Pergelic Cryosaprists (Appendix, P-2, 5, 7, 17 and 20) would be classified at the subgroup level as Terric Hemgelists in the proposed scheme.

As another suggestion, a ruptic pedon might be recognized for all polygonal patterned ground (low center, slightly convex and high center polygons) providing enlargement of the maximum dimensions of the expanded pedon were adopted (see p. 52). For example, if the pedon was redefined to coincide with one low center polygon (Appendix, P-17; p. 36) a taxon name of Ruptic-Sapristic Hemgelist could denote the dominance of hemic material associated with the soils of the center, trough and hummock elements interrupted by the intergrade soils of the rim elements.

Mineral soils with a pergelic temperature regime would continue to be classified at the order level based on diagnostic horizons of the active layer. The pergelic temperature regime would be recognized at the suborder level, denoted by the formative element "gel" in the taxon name (e.g. "Geloll" denoting these cold Mollisols). The classification at the great group level would be based on soil moisture regime, if aquic, otherwise, it would be based on the existence and nature of other diagnostic horizons such as calcic horizons (denoted by "calci"). The subgroup level would be used to express the degree of conformity or nonconformity of the soil relative to the central concept of the great group. The term "typic" would be used to indicate conformity to the central concept of the great group. Other terms would be used to indicate intergrade or extragrade subgroups. Classification at the family level would continue to be based on particle size class, mineralogy and reaction class of the active layer.

For example, excessively drained soils of earth hummock terrain that are forming in pingos and dissection slopes would be classified at the subgroup level as Typic Calcigelolls. Soils with overthickened mollic epipedons would be classified as Cumulic Calcigelolls.

Mollisols of slightly convex polygonal terrain would be classified as Typic Aqugelolls existing in a complex with Terric Hemgelists forming in the trough elements. If the pedon was permitted to coincide with the polygon, the pedon would be classified as a Ruptic-Gelistic Aqugeloll.

Soils of frost boil terrain that are dominantly Mollisols interrupted by Inceptisols of the frost boils would be classified at the subgroup level as a Ruptic-Geleptic Aqugeloll, using the expanded pedon. The term "Gelept" denotes the cold Inceptisol of the frost boil element.

Defining Organic Soil Material

A final suggestion centers on a re-examination of the organic carbon criteria used in the determination of mineral versus organic soil material. On a volume basis, the surface organic horizons are dominantly comprised of organic material. Yet on a weight basis, these horizons in the eastern part of the study area consistently exhibit low organic carbon contents (see p. 21). This is presumably due to differential loess deposition occurring in the area with subsequent mineral dilution of the organic matrix. It may be desirable to establish alternate criteria pertaining to organic matter content on a volume basis to adequately classify the soil material forming under these conditions.

Table 5. Outline of major classification changes suggested for the Prudhoe Bay region.

LANDFORM	CLASSIFICATION	CLASSIFICATION[1]	EXPANDED PEDON[1]
drained lake basin	Pergelic Cryofibrist	Terric Fibgelist	--
low center polygon	Pergelic Cryohemist- Pergelic Cryosaprist complex	Terric Hemgelist	Ruptic-Sapristic Hemgelist
slightly convex polygon	Pergelic Cryaquoll- Histic Pergelic Cryaquept complex	Typic Aqugeloll- Terric Hemgelist complex	Ruptic-Gelistic Aqugeloll
frost boil terrain	Pergelic Cryaquoll- Pergelic Cryaquept complex	Ruptic-Geleptic Aqugeloll	--
earth hummock terrain	Pergelic Cryoboroll	Typic Calcigeloll; Cumulic Calcigeloll	--

[1]Based on pergelic temperature regime recognized at suborder level

CONCLUSIONS

Soil genesis, morphology and classification at Prudhoe Bay are closely related to several geomorphic processes including: (1) the thaw lake cycle; (2) patterned ground formation; and (3) differential loess deposition. Most, if not all, of the study area has been worked at one time or another by migrating thaw lakes. Consequently, the lower sections of the soils including the upper sections of permafrost typically consist of highly variable organic and/or mineral-rich thaw lake sediment.

The formation of patterned ground types, such as low center polygons, high center polygons and frost boils, creates microtopographic landform elements which are cyclic at relatively constant intervals. In addition to influencing plant distribution, these landform elements are pedologically important as they affect soil properties such as drainage, organic matter decomposition, depth of active layer and classification.

Aperiodic loess deposition is thought to explain the soil reaction gradient that exists from east to west across the study area. The soils of the eastern part are mildly or moderately alkaline (calcareous) while those to the west tend to be more acid. Regional correlation of surficial organic horizons samples throughout the study area indicated a close negative correlation between $CaCO_3$ equivalent and organic carbon content. $CaCO_3$ equivalent of the soil was inversely proportional to the distance from the main source of calcareous loess, the Sagavanirktok River. Apparently, organic matter content of the soils subjected to loess deposition is being diluted in proportion to the addition of mineral material.

The testing of Soil Taxonomy (1975) relative to the soils of the Prudhoe Bay study area resulted in the following suggested major modifications: (1) redefining the maximum dimensions of the expanded pedon; (2) classifying the soil based on properties of the active layer; (3) recognition of the pergelic temperature regime at a higher categorical level (suborder); and (4) re-examining the definition of organic soil material in light of significant organic matter dilution by relatively small amounts of loess. Modifications of a minor nature were developed involving the establishment of new taxa at low categorical levels.

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APPENDIX A

PEDON DESCRIPTIONS

All sample site locations referable to the following USGS Quadrangles:

Beechey Point B-3, SE, Alaska, 1970

Beechey Point B-4, SE, Alaska, 1970

Beechey Point B-3, SW, Alaska, 1970

Beechey Point A-3, NE, Alaska, 1970

Beechey Point A-3, NW, Alaska, 1970

Aerial photography from Air Photo Tech, Anchorage, Alaska.

Note: ss numbers following horizon descriptions refer to soil sample identification. Data presented in Appendix B.

Site: PBR-50
Location: NW ¼, SE ¼, Sec. 23, T. 11N., R. 13E.
Classification: Pergelic Cryoboroll, sandy-skeletal mixed
Landform: nonsorted net (earth hummock) on a pingo
Element: hummock
Parent material: organic rich lacustrine sediment overlying Gubik Formation sediment
Relief: macro = 15 m; micro = 10 cm
Slope: 14 percent
Vegetation: Dryas integrifolia, Cladonia spp, Thamnolia subuliformis, and Saxifraga spp.

Notes: Pit located on shoulder of Angel pingo summit where differences in microtopographic relief were somewhat depressed due to erosion; permafrost table at 61 cm on 7/12/74; permafrost table at 104 cm on 9/2/74;
lab data included in Appendix B, pp. 130 and 139.

Horizon and Depth (cm)		Description
A11ca	0-10	5 Very dusky red (2.5YR 2/2) organic rich silt loam; moderate coarse granular structure; very friable; white (10YR 8/2) carbonate filaments occupying about 8 percent of total volume; thin patchy white (10YR 8/2) carbonate coatings on undersides of gravel; moderately alkaline; slight effervescence; est. 10 percent gravel; common roots; clear wavy boundary ss 3177
A12ca	10-18	14 Dark brown (7.5YR 3/2) silt loam; moderate fine granular structure; very friable; thin patchy white (10YR 8/2) carbonate coatings on undersides of gravel; mildly alkaline; slight effervescence; est. 14 percent gravel; few roots; abrupt wavy boundary ss 3178
IIC1	18-35	27 Grayish brown (2.5YR 5/2) sand; single grain; loose; thin patchy dark grayish brown (2.5Y 4/2) silt coatings on upper sides of gravel; thin patchy white (10YR 8/2) carbonate coatings on undersides of gravel; moderately alkaline; slight effervescence; est. 5 percent gravel; no roots; clear smooth boundary ss3179

IIC2ca	35-46 40	Grayish brown (2.5Y 5/2) gravelly fine sand; single grain; loose; thin patchy dark grayish brown (2.5Y 4/2) silt coatings on uppersides of gravel; thin patchy white (10YR 8/2) carbonate coatings on undersides of gravel; moderately alkaline; strong effervescence; est. 35 percent gravel; clear smooth boundary ss 3180
IIC3ca	46-61 54	Grayish brown (2.5Y 5/2) very gravelly sand; single grain; loose; thin patchy dark grayish brown (2.5Y 4/2) silt coatings on the upper sides of gravel; thick patchy white (10YR 8/2) carbonate coatings on the undersides of gravel; moderately alkaline; strong effervescence; est. 80 percent gravel; abrupt smooth boundary ss 3181
IIC4	61-68 64	Grayish brown (2.5Y 5/2) very gravelly coarse sand; single grain; loose; thin very patchy dark grayish brown (2.5Y 4/2) silt coatings on upper sides of gravel; thin patchy white (10YR 8/2) carbonate coatings on the undersides of gravel; moderately alkaline; slight effervescence; est. 85 percent gravel; abrupt smooth boundary ss 3182
IIC5	68-94 71	Yellowish brown (10YR 5/4) gravelly coarse sand; single grain; loose; thin patchy white (10YR 8/2) carbonate coatings on undersides of some gravel; strongly alkaline; strong effervescence; est. 35 percent gravel ss 3294

Collected by: K. Everett
R. Parkinson
Weather: sunny, cool
Date: 7/12/74

Site: PBR 24-036M
Location: SE ¼, NE ¼, Sec. 25, T. 11N., R. 14E.
Classification: Pergelic Ruptic Aqueptic Cryaquoll, loamy mixed (calcareous)
Landform: nonsorted circle (frost boil)
Element: hummock
Parent material: organic rich lacustrine sediment
Relief: macro < 1 m; micro = 13 cm
Slope: 1 percent
Vegetation: _Eriophorum vaginatum_, _Thamnolia subuliformis_, _Dryas integrifolia_; moss
Notes: permafrost depth ranged from 36 cm to 43 cm in a 23 cm x 46 cm pit; permafrost depth was inversely proportional to the thickness of the mollic epipedon; this site located 1.52 m from site PBR 24-036F; Taxon not currently established; Soils currently recognized as Pergelic Cryaquoll-Pergelic Cryaquept complex;
lab data included in Appendix B, pp. 130 and 139

Part I--Hummock Element

Horizon and Depth (cm)		Description
A1	0-23	Very dark grayish brown (10YR 3/2) (broken face and rubbed) silt loam; few fine prominent yellowish red (5YR 4/6) and few fine distinct strong brown (7.5YR 5/6) mottles along root channels; moderate fine granular structure; friable; moderately alkaline; strong effervescence; common roots; abrupt wavy boundary ss 3258
B2g	23-30	Dark grayish brown (2.5Y 4/2) loam; weak medium platy structure; firm; moderately alkaline; strong effervescence; few roots; clear wavy boundary ss 3259
IIC1	30-43	Black (10YR 2/1) silt loam; moderate fine granular structure; friable; mildly alkaline; strong effervescence; est. 3 percent gravel; few roots; abrupt wavy boundary ss 3260
IIC2f	43-57	Dark brown (7.5YR 3/2) loam; moderately alkaline; strong effervescence; est. 3 percent gravel; frozen; abrupt wavy boundary ss 3261
IIC3f	57-69	Gray (5Y 5/1) loamy fine sand; mildly alkaline; strong effervescence; est. 3 percent gravel; frozen ss 3262

Collected by: R. Parkinson
Weather: cloudy, cool
Date: 8/16/74

Site: PBR 24-036F
Location: SE ¼, NE ¼, Sec. 25, T. 11N., R. 14E.
Classification: Pergelic Ruptic Aqueptic Cryaquoll, loamy mixed (calcareous)
Landform: nonsorted circle (frost boil)
Element: frost boil
Parent material: organic rich lacustrine sediment
Relief: macro < 1 m; micro = 13 cm
Slope: 1 percent
Vegetation: Saxifraga oppositifolia; Thamnolia subuliformis, Dryas integrifolia, moss
Notes: Permafrost depth ranged from 48 cm to 56 cm in the 30 cm x 40 cm pit, and was inversely proportional to the thickness of the overlying vegetative mat; (mat thickness ranged from 2-6 cm thick); pit located 1.52 m from site PBR 24-036M; Taxon not currently established;
Soils currently recognized as Pergelic Cryaquoll-Pergelic Cryaquept complex;
lab data included in Appendix B, pp. 130, 131 and 139

Part II--Frost Boil Element

Horizon	Depth (cm)	Description
O1	2-0	Very dark brown (10YR 2/2) (broken face) intermediately decomposed plant material; black (10YR 2/1) (rubbed and pressed); massive; friable; moderately alkaline; strong effervescence; abrupt wavy boundary
B2g	0-36	Olive gray (5Y 5/2) loam; common fine distinct yellowish brown (10YR 5/4) and dark gray (5Y 4/1) mottles; weak medium platy structure; firm; yellowish red (5YR 5/6) mottles along root channels from 0 to 8 cm; moderately alkaline; strong effervescence; few roots; abrupt wavy boundary ss3263
IIC1	36-48	Black (10YR 2/1) silt loam; moderate fine granular structure; friable; mildly alkaline; strong effervescence; few roots; abrupt smooth boundary ss 3264
IIC2f	48-73	Very dark grayish brown (10YR 3/2) silt loam; moderately alkaline; strong effervescence; est. 3 percent gravel; frozen ss3265

Collected by: R. Parkinson
Weather: cloudy, cool
Date: 8/16/74

Site: PBR 28-037
Location: SE ¼, NW ¼, Sec. 2, T. 10N., R. 14E.
Classification: Pergelic Cryaquoll, loamy, mixed (calcareous)
Landform: slightly convex polygon
Element: hummock
Parent material: degraded mineral rich histic epipedon overlying organic rich lacustrine sediment and Gubik Formation sediment
Relief: macro < 1 m; micro = 13 cm
Slope: 1 percent
Vegetation: Eriophorum angustifolium; Salix reticulata; Saxifraga oppositifolia; Dryas integrifolia; Salix arctica; Cassiope tetragona; Pedicularis kaneii; Minuartia arctica; Chrysanthemum integrifolium; Carex aquatilis; Carex scirpoidea
Moss: Drepanocladus uncinatus; Tomenthypnum nitens; Ditrichum flexicaule; Distichium capillaceum; Hypnum procerrimum spp.
Lichens: Thamnolia subuliformis; Dactylna arctica; Lecanora epibryon; Cetraria richardsonii; Cetraria islandica; Rinodina sp.
Notes: Plant identification by D.A. Walker, University of Colorado; $T_{10cm} = 4^{o}C$; Polygon area = 63 m^2; Center element = 57 m^2 (90%); Trough element = 6 m^2 (10%); lab data included in Appendix B, pp. 131 and 139

Horizon and Depth (cm)		Description
A11	0-13	Dark brown (7.5YR 3/2) silt loam; moderate very fine granular structure; friable; moderately alkaline; strong effervescence; common roots; clear smooth boundary ss 3266
A12	13-23	Dark brown (7.5YR 3/2) silt loam; common fine prominent dark red (2.5YR 3/6) and few fine prominent red (2.5YR 4/8) mottles along root channels; weak medium and coarse platy structure parting to moderate fine granular; friable; moderately alkaline; slight effervescence; common roots; clear smooth boundary ss 3267
IIO21	23-36	Dark reddish brown (5YR 2/2) finely divided organic matter; moderate medium and coarse platy structure parting to strong medium granular; friable; moderately alkaline; slight effervescence; est. 2 percent gravel; common roots; abrupt smooth boundary ss 3268

II022	36-38	Black (10YR 2/1) finely divided organic matter; weak fine platy parting to weak fine granular structure; slightly sticky; mildly alkaline; slight effervescence; abrupt smooth boundary ss 3269
II023f	38-48	Black (10YR 2/1) (wet, thawed); finely divided organic matter; mildly alkaline; slight effervescence; frozen; abrupt wavy boundary ss 3270
IIICf	48-66	Dark gray (5Y 4/1) loamy sand; single grain; moderately alkaline; strong effervescence; est. 10 percent gravel; frozen; estimated 40 percent ice crystals ss 3271

Collected by: K. Everett
R. Parkinson

Weather: sunny, cool
Date: 8/26/74

Site: PBR 28A-034
Location: SW ¼, SW ¼, Sec. 1, T. 10N., R. 14E.
Classification: Histic Pergelic Cryaquept, loamy mixed (calcareous)
Landform: low center polygon
Element: center
Parent material: organic mat overlying organic rich lacustrine sediment
Relief: macro < 1 m; micro = 18 cm
Slope: 1 percent
Vegetation: Carex aquatilis; Drepanocladus spp.
Notes: Polygon area = 120 m^2; rims = 24 m^2 (20%); Troughs = 12 m^2 (10%); center = 84 m^2 (70%); T_{air} = 2^oC; T_{10cm} = 2^oC; lab data included in Appendix B, pp. 131, 139 and 140

Horizon and Depth (cm)		Description
01	0-23	Very dark brown (10YR 2/2) (broken face, rubbed and pressed) moderately decomposed organic material (est. 60 percent fiber, 40 percent fiber, rubbed); weak medium platy structure, nonsticky; moderately alkaline; strong effervescence; many roots; abrupt smooth boundary ss 3272
IIC1	23-33	Very dark gray (10YR 3/1) silt loam; weak coarse platy structure; slightly sticky; moderately alkaline; slight effervescence; few roots; abrupt smooth boundary ss 3273
IIC2f	33-48	Very dark gray (10YR 3/1) silt loam; moderately alkaline; strong effervescence; frozen ss 3274

Collected by: R. Parkinson
Weather: cloudy
Date: 8/19/74

Site: PBR 23-024
Location: SW ¼, SW ¼, Sec. 34, T. 11 N., R. 15 E.
Classification: Pergelic Cryaquept, euic
Landform: low center polygon
Element: center
Parent material: organic mat subject to loess and eolian sand deposition
Relief: macro < 1 m; micro = 43 cm
Slope: 0 percent
Vegetation: <u>Carex</u> <u>aquatilis</u>, water tolerant mosses
Notes: site located 0.5 km west of Sagavanirktok River floodplain; polygon area = 277 m^2 rim area = 100 m^2 (36%); trough area = 17 m^2 (6%); center area = 160 m^2 (58%); water table at 5 cm; $T_{10\ cm}$ = 0.5°C; organic carbon content is significantly reduced due to loess deposition; lab data included in Appendix B, pp. 131, 132 and 140

Horizon and Depth (cm)		Description
Oi 1	0-8	Very dark brown (10YR 2/2) (rubbed and pressed) fibric material composed dominantly of sedge and moss; about 80 percent fibers, 75 percent after rubbing; fibers break down with difficulty; weak medium platy structure; nonsticky; moderately alkaline; strong effervescence; appreciable dark gray (N 4/) silt loam content; many roots; clear smooth boundary ss 3275
Oi2	8-30	Very dark brown (10YR 2/2) (rubbed and pressed) fibric material composed dominantly of sedge; about 80 percent fibers, 75 percent after rubbing; fibers break down with difficulty; weak medium platy structure; nonsticky; moderately alkaline; strong effervescence; appreciable dark gray (N 4/) silt loam content; many roots; clear smooth boundary ss 3276
Oi3	30-41	Dark brown (10YR 3/3) (rubbed and pressed) fibric material composed dominantly of sedge; about 85 percent fibers, 80 percent after rubbing; fibers break down with difficulty; weak medium platy structure; nonsticky; moderately alkaline; strong effervescence; appreciable dark gray (N 4/) sandy loam content; sand lense from 35 to 38 cm; many roots; abrupt smooth boundary ss 3277

Oi4f	41-56	Dark brown (10YR 3/3) (rubbed and pressed) fibric material composed dominantly of sedge; about 85 percent fibers, 80 percent after rubbing; fibers break down with difficulty; nonsticky; moderately alkaline; strong effervescence; appreciable loam content; frozen ss 3278

Collected by: K. Everett
R. Parkinson
Weather: sunny, cool
Date: 8/25/74

Site: PBR 29-042 R
Location: SW ¼, NW ¼, Sec. 4, T. 10 N., R. 14 E.
Classification: Pergelic Cryohemist, euic
Landform: low center polygon
Element: rim
Parent material: organic material overlying organic rich lacustrine sediment
Relief: macro < 1 m; micro = 25 cm
Slope: 1 percent
Vegetation: Dryas integrifolia, Thamnolia subuliformis, Eriophorum spp.
Notes: polygon area = 220 m^2; rim area = 59 m^2 (27%); trough area = 16 m^2 (7%); center area = 145 m^2 (66%); lab data included in Appendix B, pp. 132 and 140

Horizon and Depth (cm)		Description
A11	0-5	Very dark grayish brown (10YR 3/2) (broken face, rubbed) organic rich silt loam; moderate fine granular structure; friable; moderately alkaline; strong effervescence; common roots; abrupt smooth boundary ss 3279
A12cair	5-8	White (10YR 8/2) and light gray (10YR 7/2) band of carbonate nodule rich silt loam from 5 to 7 cm overlying yellowish red (5YR 5/6) band of silt loam; weak fine granular structure; friable; moderately alkaline; violent effervescence; common roots; abrupt smooth boundary ss 3280
Oe1	8-13	Very dark grayish brown (10YR 3/2) (broken face, rubbed), hemic material; about 55 percent fibers, 35 percent after rubbing; weak coarse platy structure; moderately alkaline; slight effervescence; many roots; abrupt smooth boundary ss 3281
IIC1	13-23	Very dark gray (10YR 3/1) (broken face, rubbed) organic rich silt loam; moderate medium platy structure; slightly sticky; thin very patchy white (10YR 8/2) carbonate coatings on undersides of some gravel; moderately alkaline; slight effervescence; est. 3 percent gravel; few roots; abrupt smooth boundary ss 3282

IIOi1	23-43	Very dark brown (10YR 2/2) (broken face, rubbed) fibric material; about 80 percent fibers, 75 percent after rubbing; weak medium platy structure; nonsticky; dark gray (5Y 4/1) wavy band of loamy sand (est. 80 percent sand) at 33 cm; frozen at 41 cm; mildly alkaline; slight effervescence; clear smooth boundary ss 3283
IIOe2f	43-68	Black (10YR 2/1) (broken face, rubbed) (wet and thawed) hemic material; about 30 percent fibers, 20 percent after rubbing; moderately alkaline; slight effervescence; frozen ss 3284

Collected by: K. Everett
R. Parkinson
Weather: cloudy, cold, windy
Date: 9/1/74

Site: PBR 29-042 T
Location: SW ¼, NW ¼, Sec. 4, T. 10 N., R. 14 E.
Classification: Pergelic Cryohemist, euic
Landform: low center polygon
Element: trough
Parent material: organic material overlying organic rich lacustrine sediment
Relief: macro < 1 m; micro = 25 cm
Slope: 1 percent
Vegetation: Carex aquatilis
Notes: polygon area = 220 m^2, rim area = 59 m^2 (27%); trough area = 16 m^2 (7%); center area = 145 m^2 (66%) ice wedge encountered at 53 cm;
lab data included in Appendix B, pp. 132 and 140

Horizon	and Depth (cm)	Description
Oe1	0-13	Very dark brown (10YR 2/2) (broken face and rubbed) hemic material; about 35 percent fibers; 20 percent after rubbing; weak medium platy structure; nonsticky; grayish brown (10YR 5/2) carbonate enriched band from 10 to 12 cm; moderately alkaline; strong effervescence; abrupt smooth boundary
Oe2	13-28	Very dark grayish brown (10YR 3/2) (broken face, rubbed) hemic material; about 55 percent fibers, 35 percent after rubbing; weak coarse platy structure; nonsticky; moderately alkaline; slight effervescence; common roots; abrupt smooth boundary
IIC1	28-38	Very dark gray (10YR 3/1) (broken face, rubbed) organic rich silt loam; weak medium platy structure; slightly sticky; moderately alkaline; slight effervescence; est. 3 percent gravel; few roots; clear smooth boundary
IIOe3	38-43	Very dark brown (10YR 2/2) (broken face), very dark grayish brown (10YR 3/2) (rubbed and pressed) hemic material; about 50 percent fibers, 35 percent after rubbing; weak medium platy structure; nonsticky; mildly alkaline; slight effervescence; abrupt smooth boundary

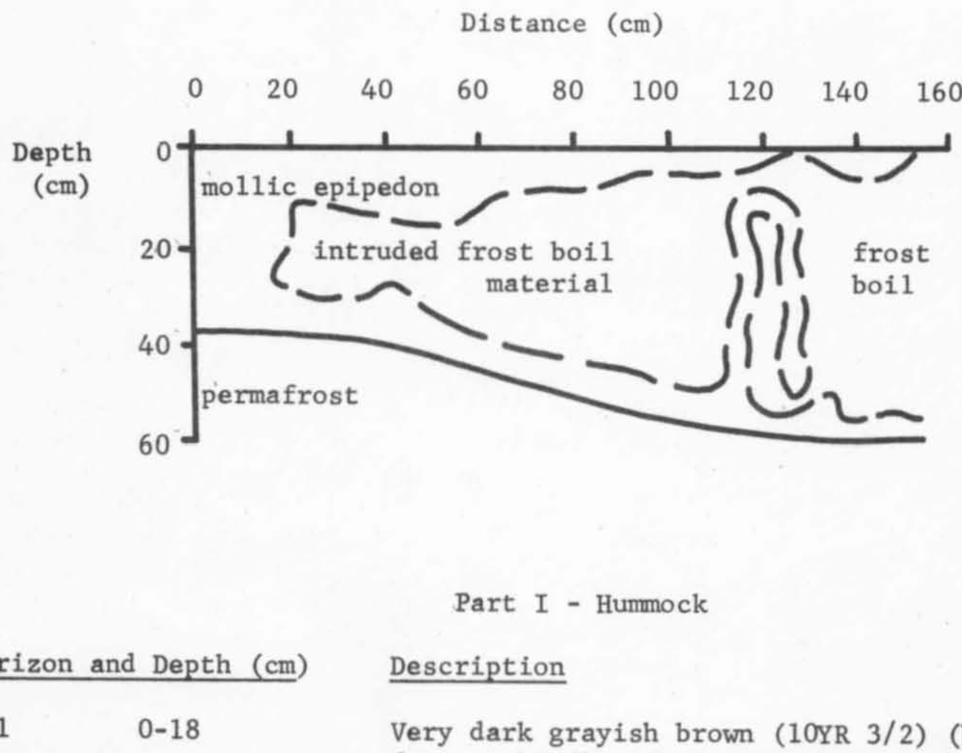
IIOe4f	43-53	Very dark brown (10YR 2/2) (rubbed and pressed) hemic material; about 50 percent fibers, 30 percent after rubbing; moderately alkaline; slight effervescence; frozen

ss3285

Collected by: K. Everett
R. Parkinson

Weather: cloudy, cold, windy
Date: 9/1/74

Location: SE ¼, SW ¼, Sec. 27, T. 11 N., R. 14 E.
Classification: Pergelic Ruptic Aqueptic Cryaquoll, loamy, mixed (calcareous)
Landform: nonsorted circle (frost boil)
Parent material: organic rich lacustrine sediment overlying Gubik Formation sediment
Relief: macro < 1 m; micro = 13 cm
Slope: 1 percent
Vegetation: Dryas integrifolia, Thamnolia subuliformis
Notes: pedon includes 2 parts--1. nonsorted earth hummock; 2. nonsorted circle (frost boil), cyclic at 3.0 m intervals; half cycle (center of frost boil to center of hummock) cyclic at 1.5 m (equivalent to the pedon); areal extent (estimated) of frost boils = 40 percent; hummocks = 50 percent, interhummock - boil = 10 percent; mean distance of full cycle = 2.5 m (N = 26); mean pedon dimension = 1.25 m (N = 26), equivalent to half cycle; taxon not currently established; soils currently recognized as Pergelic Cryaquoll-Pergelic Cryaquept complex



Part I - Hummock

Horizon and Depth (cm)		Description
A11	0-18	Very dark grayish brown (10YR 3/2) (broken face, rubbed) silt loam; moderate very fine granular structure; friable; mildly alkaline; slight effervescence; many roots; abrupt wavy boundary

A12	18-30	Very dark grayish brown (10YR 3/2) (broken face, rubbed) silt loam; few fine distinct yellowish red (5YR 4/6) mottles along root channels; moderate coarse platy structure parting to moderate coarse angular blocky; friable; mildly alkaline; slight effervescence; few roots; abrupt wavy boundary
C1	30-38	Black (10YR 2/1) (broken face, rubbed) organic rich silt loam; moderate medium platy structure parting to moderate fine granular; friable; mildly alkaline; slight effervescence; no roots; abrupt wavy boundary
C2f	38-48	Black (10YR 2/1) (broken face, rubbed) (wet, thawed) organic rich silt loam; mildly alkaline; slight effervescence; frozen; abrupt wavy boundary
IIC3f	48-64	Dark gray (5Y 4/1) (wet, thawed) sandy loam; few dark brown (10YR 3/3) streaks; moderately alkaline; strong effervescence; frozen

Part II - Frost Boil

Horizon and Depth (cm)		Description
B1g	0-5	Grayish brown (2.5Y 5/2) fine sandy loam; weak medium platy structure; firm; common coarse dark gray (5Y 4/1) streaks; moderately alkaline; strong effervescence; few roots; clear wavy boundary
B2g	5-28	Dark gray (5Y 4/1) fine sandy loam; common coarse distinct yellowish brown (10YR 5/4) mottles and few fine distinct yellowish brown (10YR 5/6) mottles along root channels; moderate medium platy structure; firm; some small smears of dark grayish brown (10YR 4/2) silt loam; moderately alkaline; strong effervescence; few roots; abrupt wavy boundary

C1	28-46	Grayish brown (2.5Y 5/2) fine sandy loam; few medium distinct yellowish brown (10YR 5/4) mottles; strong coarse platy structure, very firm; moderately alkaline; strong effervescence; few roots; abrupt wavy boundary
Alb	46-61	Very dark grayish brown (10YR 3/2) (broken face, rubbed) very fine sandy loam; moderate medium subangular blocky structure; friable, mildly alkaline; strong effervescence; abrupt wavy boundary
C2f	61-91	Black (10YR 2/1) (wet thawed) organic rich very fine sandy loam; mildly alkaline; slight effervescence; no roots; frozen

Collected by: K. Everett
R. Parkinson

Weather: cloudy, windy, cool with fine drizzle

Date: 9/2/74

Site: P-1IH
Location: NE ¼, NE ¼, Sec. 35, T. 11N., R. 14E.
Classification: Pergelic Cryaquoll, loamy, mixed (calcareous)
Landform: slightly convex polygon
Element: interhummock
Parent material: degraded histic epipedon and/or organic rich lacustrine silt
Relief: macro = 1 m; micro = 15 cm
Slope: 1 percent
Notes: polygon area = 60 m^2; center element = 58 m^2 (97%)
lab data included in Appendix B, pp. 133 and 140

Horizon and Depth (cm)		Description
01	2-0	Mat of living sedge, lichen, moss, Equisetum sp Dryas sp
A11	0-8	Very dark grayish brown (10YR 3/2) silt loam; moderate coarse platy parting to moderate very fine granular structure; friable; mildly alkaline; strong effervescence; common roots; clear smooth boundary ss 3671
A12	8-20	Very dark grayish brown (10YR 3/2) silt loam; weak medium platy parting to moderate very fine granular structure; friable; common fine distinct yellowish red (5YR 4/6) mottles along root channels; mildly alkaline; strong effervescence; common roots; clear smooth boundary ss 3672
IIC1	20-35	Very dark grayish brown (10YR 3/2) silt loam; moderate very coarse platy structure; friable; few medium distinct dark brown (7.5YR 4/4) mottles; few very dark brown (10YR 2/2) streaks; moderately alkaline; strong effervescence; est. 1 percent gravel; few roots; abrupt smooth boundary ss 3673
IIC2f	35-61	Very dark brown (wet) (10YR 2/2) silt loam; mildly alkaline; strong effervescence; est. 2 percent gravel; frozen ss 3674

Collected by: R. Parkinson
Weather: sunny, cool
Date: 7/18/75

Site: P-1H
Location: NE ¼, NE ¼, Sec. 35, T. 11N., R. 14E.
Classification: Pergelic Cryaquoll, loamy, mixed (calcareous)
Landform: slightly convex polygon
Element: hummock
Parent material: degraded histic epipedon and/or organic rich lacustrine silt
Relief: macro < 1 m; micro = 15 cm
Slope: 1 percent
Notes: lab data included in Appendix B, pp. 133 and 140

<u>Horizon and Depth (cm)</u>		<u>Description</u>
01	2-0	Living mat of mosses, lichens and <u>Dryas</u> spp.
A11	0-5	Very dark grayish brown (10YR 3/2) silt loam; moderate fine granular structure; friable; mildly alkaline; strongly effervescent; many roots; clear smooth boundary ss 3676
A12	5-13	Very dark grayish brown (10YR 3/2) silt loam; common fine distinct yellowish red (5YR 5/6) mottles, mainly along root channels; weak coarse platy parting to moderate fine granular structure; friable; mildly alkaline; strongly effervescent; common roots; clear smooth boundary ss 3677
A13	13-23	Very dark grayish brown (10YR 3/2) silt loam; moderate very coarse platy parting to moderate fine granular structure; common fine distinct yellowish red (5YR 4/6) mottles along root channels; friable; mildly alkaline; strongly effervescent; few roots; clear smooth boundary ss 3678
IIC1	23-33	Very dark grayish brown (10YR 3/2) silt loam; moderate very coarse platy structure; firm; moderately alkaline; strongly effervescent; est. 1 percent gravel; few roots; abrupt smooth boundary ss 3679
IIC2f	33-58	Very dark grayish brown (10YR 3/2) silt loam; weak coarse platy structure; moderately alkaline; strongly effervescent; est. 1 percent gravel; frozen ss 3680

Collected by: R. Parkinson
Weather: sunny, cool
Date: 7/18/75

Site: P-1T
Location: NE ¼, NE ¼, Sec. 35, T. 11N., R. 14E.
Classification: Histic Pergelic Cryaquept, loamy, mixed (calcareous)
Landform: slightly convex polygon
Element: trough
Parent material: organic material overlying organic rich lacustrine silt
Relief: macro < 1 m; micro = 15 cm
Slope: 1 percent
Notes: Polygon area = 60 m^2; trough area = 2 m^2 (3%); lab data included in Appendix B, pp. 133 and 141

Horizon and Depth (cm)		Description
O1	13-0	Dark yellowish brown (10YR 3/4), (10YR 3/3 rubbed) hemic material composed of mosses and sedge; weak coarse platy structure; mildly alkaline; strongly effervescent; abrupt irregular boundary; ranges from 8-18 cm thick ss 3681
A1	0-5	Very dark grayish brown (10YR 3/2) silt loam; moderate fine granular structure; friable; common fine distinct yellowish red (5YR 5/6) mottles; moderately alkaline; strongly effervescent; common roots; abrupt smooth boundary; ranges from 0-13 cm thick ss 3682
IIC1f	5-42	Very dark grayish brown (10YR 3/2) silt loam; mildly alkaline; strongly effervescent; est. 2 percent gravel; frozen ss 3683

Collected by: R. Parkinson
Weather: sunny, cool
Date: 7/18/75

Site: P-2C
Location: NE ¼, NE ¼, Sec. 35, T. 11N., R. 14E.
Classification: Histic Pergelic Cryaquept, loamy, mixed (calcareous)
Landform: low center polygon
Element: center
Parent material: sedge peat overlying organic rich lacustrine sediment
Relief: macro < 1 m; micro = 23 cm
Slope: 1 percent
Notes: Polygon area = 273 m^2; center element = 141 m^2 (52%)
trough element = 10 m^2 (4%);
lab data included in Appendix B, pp. 133 and 141

Horizon and Depth (cm)		Description
011	0-13	Very dark grayish brown (10YR 3/2), rubbed) mat of somewhat decomposed sedge roots and stems (est. 60 percent fiber, 8 percent after rubbing); weak medium platy structure; friable; gray (5Y 5/1) sandy loam bands about 5 mm thick at 9 and 12 cm; mildly alkaline; strongly effervescent; many roots; clear smooth boundary ss 3684
012	13-20	Very dark brown (10YR 2/2) mat of somewhat decomposed sedge roots and stems (est. 50 percent fiber, 5 percent after rubbing) with considerable mineral content; weak medium platy structure; friable; light brownish gray (10YR 6/2) carbonate band, 5 mm thick at 15 cm; mildly alkaline; strongly effervescent; many roots; abrupt smooth boundary ss 3685
IIC1	20-33	Dark gray (10YR 4/1) fine sandy loam (est. 2 percent gravel); weak very coarse platy structure; mildly alkaline; firm; strongly effervescent; rounded coarse fragments; few roots; clear smooth boundary ss 3686
IIC2	33-40	Very dark grayish brown (10YR 3/2 rubbed and pressed) organic rich silt loam (about 60 percent fiber, 8 percent after rubbing); weak medium platy structure; friable; moderately alkaline; strongly effervescent; abrupt smooth boundary ss 3687
IIC3f	40-64	Very dark grayish brown (10YR 3/2 rubbed and pressed) organic rich silt loam; mildly alkaline; strongly effervescent; est. 1 percent gravel; frozen ss 3688

Collected by: R. Parkinson
Date: 7/16/75

Site: P-2R
Location: NE ¼, NE ¼, Sec. 35, T. 11N., R. 14E.
Classification: Pergelic Cryosaprist, euic
Landform: low center polygon
Element: rim
Parent material: sedge peat overlying organic rich lacustrine sediments
Relief: macro < 1 m; micro = 23 cm
Slope: 1 percent
Notes: Polygon area = 273 m^2; rim area = 122 m^2 (44%); lab data included in Appendix B, pp. 133, 134, and 141.

Horizon and Depth (cm)		Description
Oa1	0-5	Very dark brown (10YR 2/2 unrubbed and rubbed and pressed) sapric material (60 percent fiber, 8 percent rubbed); weak fine platy structure; friable; mildly alkaline; strongly effervescent; many roots; abrupt smooth boundary ss 3689
Oa2	5-8	Very dark brown (10YR 2/2) sapric material (20 percent fiber, 5 percent rubbed); weak very fine granular structure; friable; mildly alkaline; strongly effervescent; common roots; abrupt wavy boundary ss 3690
C1	8-11	Dark gray (5Y 4/1) fine sandy loam; weak coarse platy structure; very friable; mildly alkaline; strongly effervescent; few roots; clear wavy boundary ss 3691
Oe1	11-18	Very dark grayish brown (10YR 3/2) hemic material composed of moss parts (40 percent fiber, 20 percent rubbed); weak medium platy structure; very friable; mildly alkaline; strongly effervescent; abrupt wavy boundary ss 3692
IIOa3	18-28	Black (10YR 2/1) sapric material (15 percent fiber, 5 percent rubbed); weak coarse platy structure; friable; appreciable silt loam content; neutral; slightly effervescent; abrupt smooth boundary ss 3693
IIOa4f	28-53	Very dark brown (10YR 2/2) sapric material (10 percent fiber, 3 percent rubbed); white Salix reticulata leaf well preserved; neutral; slightly effervescent; est. 3 percent gravel; frozen ss 3694

Collected by: R. Parkinson
Weather: cloudy, cool
Date: 7/16/75

Site: P-3
Location: SW ¼, SW ¼, Sec. 25, T. 11N., R. 14E.
Classification: Histic Pergelic Cryaquept, loamy, mixed (calcareous)
Landform: drained lake basin
Parent material: organic mat overlying lacustrine silt
Relief: micro = 4 cm
Slope: 0 percent
Notes: lab data included in Appendix B, pp. 134 and 141
water table at surface

Horizon	and Depth (cm)	Description
01	0-28	Dark yellowish brown (10YR 4/4) undecomposed sedge material; weak medium platy structure; non sticky; mildly alkaline; strongly effervescent; abrupt smooth boundary ss 3695
IIC1	28-33	Dark grayish brown (2.5Y 4/2) silt loam; weak coarse platy structure; non sticky; moderately alkaline; strongly effervescent; est. 2 percent gravel; few roots; abrupt smooth boundary ss 3696
IIC2f	33-41	Dark grayish brown (2.5Y 4/2) silt loam; frozen; (not sampled)

Collected by: R. Parkinson
Weather: sunny, mild
Date: 7/18/75

Site: P-4C
Location: NW ¼, SW ¼, Sec. 18, T. 10N., R. 15E.
Classification: Histic Pergelic Cryaquept, loamy, mixed (calcareous)
Landform: low center polygon
Element: center
Parent material: organic mat over lacustrine silts
Relief: macro < 1 m; micro = 13 cm
Slope: 1 percent
Notes: Polygon area = 396 m^2; center element = 316 m^2 (80%);
permafrost table at 36 cm; water table at surface of pit;
$T_{air} = 2^oC$; $T_{10\ cm} = 4^oC$;
lab data included in Appendix B, pp. 134 and 141

Horizon and Depth (cm)		Description
01	0-28	Dark brown (7.5YR 3/2) fibrous sedge material; about 85 percent fibers, 80 percent after rubbing; weak medium platy structure; non-sticky; appreciable silt loam content; mildly alkaline; strongly effervescent; abrupt smooth boundary ss 3697
IIC1	28-36	Very dark grayish brown (10YR 3/2) silt loam; weak coarse platy structure; slightly sticky; mildly alkaline; strongly effervescent; est. 1 percent gravel; few roots; abrupt smooth boundary ss 3698

Collected by: R. Parkinson
Weather: cloudy, cool, windy
Date: 7/19/75

Site: P-4H
Location: NW ¼, SW ¼, Sec. 18, T. 10N., R. 15E.
Landform: low center polygon
Element: hummock
Parent material: organic mat overlying lacustrine silt
Relief: micro = 13 cm
Slope: 1 percent
Notes: Polygon area = 396 m^2; center element = 316 m^2 (80%);
permafrost table at 41 cm;
lab data included in Appendix B, pp. 134 and 141

Horizon	and Depth (cm)	Description
011	0-8	Dark brown (7.5YR 3/2) fibrous moss and sedge material; about 85 percent fibers; 75 percent after rubbing; massive; nonsticky; appreciable loam content; mildly alkaline; strongly effervescent; clear smooth boundary ss 3700
012	8-30	Very dark grayish brown (10YR 3/2) fibrous sedge material; about 80 percent fibers, 75 percent after rubbing; weak medium platy structure; nonsticky; appreciable silt loam content; mildly alkaline; strongly effervescent; abrupt smooth boundary ss 3701
IIC1	30-41	Very dark grayish brown (10YR 3/2) silt loam; weak coarse platy structure; slightly sticky; mildly alkaline; strongly effervescent; est. 1 percent gravel; few roots; abrupt smooth boundary ss 3702

Collected by: R. Parkinson
Weather: cloudy, cool, windy
Date: 7/19/75

Site: P-4R
Location: NW ¼, SW ¼, Sec. 18, T. 10N., R. 15E.
Landform: low center polygon
Element: rim
Parent material: organic mat over lacustrine silts
Relief: macro < 1 m; micro = 13 cm
Slope: 1 percent
Notes: Polygon area = 396 m^2; rim element = 52 m^2 (13%); T_{air} = 2°C; $T_{10\ cm}$ = 2°C; permafrost table at 36 cm; lab data included in Appendix B, pp. 134, 141 and 142

Horizon and Depth (cm)		Description
O11	0-10	Very dark brown (10YR 2/2) somewhat decomposed sedge and moss material; about 40 percent fibers, 20 percent rubbed; weak medium platy structure; friable; mildly alkaline; strongly effervescent; many roots; clear smooth boundary ss 3704
O12	10-25	Dark brown (7.5YR 3/2) fibrous sedge material; about 80 percent fibers, 75 percent after rubbing; weak medium platy structure; non-sticky; mildly alkaline; strongly effervescent; abrupt smooth boundary ss 3705
IIC1	25-36	Very dark grayish brown (10YR 3/2) silt loam; weak very coarse platy structure; slightly sticky; mildly alkaline; strongly effervescent; est. 5 percent gravel; few roots; abrupt smooth boundary ss 3706

Collected by: R. Parkinson
Weather: cloudy, cool, windy
Date: 7/19/75

Site: P-4T
Location: NW ¼, SW ¼, Sec. 18, T. 10N., R. 15E.
Landform: low center polygon
Element: trough
Parent material: organic mat over organic rich lacustrine silt
Relief: macro < 1 m; micro = 13 cm
Slope: 1 percent
Notes: Polygon area = 396 m^2; trough element = 28 m^2 (7%); troughs range in width from 63 cm to 76 cm; permafrost table at 36 cm; $T_{air} = 2^oC$; lab data included in Appendix B, pp. 138 and 145

Horizon and Depth (cm)		Description
01	0-28	Very dark grayish brown (10YR 3/2) fibrous sedge material about 85 percent fibers, 80 percent after rubbing; weak medium platy structure; non-sticky; mildly alkaline; strongly effervescent; abrupt smooth boundary ss 3817
IIC1	28-36	Very dark grayish brown (10YR 3/2) silt loam; weak coarse platy structure; slightly sticky; mildly alkaline; strongly effervescent; few roots; abrupt smooth boundary ss 3818

Collected by: R. Parkinson
Weather: cloudy, cool, windy
Date: 7/19/75

Site: P-5C
Location: SW ¼, SE ¼, Sec. 7, T. 10N., R. 15E.
Classification: Histic Pergelic Cryaquept, loamy, mixed (calcareous)
Landform: low center polygon
Element: center
Parent material: organic mat over organic rich lacustrine silt
Relief: macro < 1 m
Slope: 1 percent
Notes: Polygon area = 148 m^2; center element = 71 m^2 (48%);
Average area of 27 polygons = 193 m^2; T_{air} = 18°C; T_{10cm} = 4°C;
permafrost table at 41 cm;
lab data included in Appendix B, p. 142

Horizon and Depth (cm)		Description
01	0-25	Very dark grayish brown (10YR 3/2) mat of somewhat decomposed sedge material; about 50 percent fiber, 30 percent rubbed; weak medium platy structure (2 mm); nonsticky; moderately alkaline; strongly effervescent; abrupt smooth boundary ss 3708
IIC1	25-41	Very dark grayish brown (10YR 3/2) silt loam; moderate coarse platy structure; slightly sticky; strongly effervescent; few roots; abrupt smooth boundary (not sampled)

Collected by: R. Parkinson
Weather: sunny, warm
Date: 7/20/75

Site: P-6
Location: NE ¼, NE ¼, Sec. 18, T. 10N., R. 15E.
Source material: Sagavanirktok River flood plain
Notes: gravel pad; $T_{air} = 18^{o}C$; $T_{10\ cm} = 10^{o}C$
lab data included in Appendix B, pp. 134 and 142

Horizon and Depth (cm)		Description
C	0-120	Light brownish gray (10YR 6/2) very gravelly coarse sand; single grain; loose; mildly alkaline; strongly effervescent; est. 60 percent gravel; (sampled from 0-25 cm) ss 3710

Collected by: R. Parkinson
Weather: sunny, warm
Date: 7/20/75

Site: P-7R
Location: SW ¼, SE ¼, Sec. 14, T. 10N., R. 14E.
Classification: Pergelic Cryosaprist, euic
Landform: low center polygon
Element: rim
Parent material: organic mat over organic rich lacustrine deposits
Relief: < 1 m
Slope: < 1 percent
Notes: Polygon area = 189 m^2; rim element = 61 m^2 (32%);
$T_{10\ cm} = 4^oC$;
lab data included in Appendix B, pp. 134 and 142

Horizon and Depth (cm)		Description
Oa1	0-5	Very dark grayish brown (10YR 3/2) sapric material; about 25 percent fibers, 10 percent after rubbing; weak fine granular structure; friable; grayish brown (10YR 5/2) carbonate band (5-25 mm thick) overlying reddish brown (5YR 4/4) ferric band (3 mm thick) at 3 cm depth; moderately alkaline; strongly effervescent; common roots; abrupt wavy boundary ss 3711
Oe1	5-23	Very dark grayish brown (10YR 3/2) hemic sedge material; about 60 percent fibers, 35 percent after rubbing; weak medium platy structure (5 mm thick); friable; dark gray (5Y 4/1) loamy sand lense (3 mm thick) at 21 cm depth; mildly alkaline; slightly effervescent; many roots; abrupt wavy boundary ss 3712
IIOa2	23-30	Very dark grayish brown (10YR 3/2) sapric material; about 10 percent fibers, less than 5 percent after rubbing; weak coarse platy parting to moderate fine granular structure; firm; est. 5 percent gravel; mildly alkaline; slightly effervescent; common roots; abrupt wavy boundary ss 3713
IIOa3f	30-56	Very dark grayish brown (10YR 3/2) sapric material; about 10 percent fibers, less than 5 percent after rubbing; mildly alkaline; slightly effervescent; est. 1 percent gravel; frozen ss 3714

Collected by: R. Parkinson
Weather: sunny, cool
Date: 7/22/75

Site: P-7T
Location: SW ¼, SE ¼, Sec. 14, T. 10N., R. 14E.
Classification: Pergelic Cryosaprist, euic.
Landform: low center polygon
Element: trough
Parent material: organic mat over organic rich lacustrine sediment
Relief: < 1 m
Slope: < 1 percent
Notes: Polygon area = 189 m^2; trough element = 13 m^2 (7%);
$T_{10\ cm} = 2^{o}C$;
lab data included in Appendix B, pp. 134 and 142

Horizon and Depth (cm)		Description
Oi1	0-5	Dark yellowish brown (10YR 4/4) fibric material; about 90 percent fibers, 80 percent after rubbing; massive; friable; dominantly composed of mosses; mildly alkaline; slightly effervescent; abrupt wavy boundary ss 3715
Oe1	5-18	Very dark brown (10YR 2/2) hemic material about 60 percent fiber, 35 percent after rubbing; weak medium platy structure; friable; mildly alkaline; slightly effervescent; many roots; abrupt wavy boundary ss 3716
IIOa1f	18-41	Very dark grayish brown (10YR 3/2) sapric material; about 10 percent fibers, less than 5 percent after rubbing; mildly alkaline; slightly effervescent; frozen ss 3717

Collected by: R. Parkinson
Weather: sunny, cool
Date: 7/22/75

Site: P-7C
Location: SW ¼, SE ¼, Sec. 14, T. 10N., R. 14E.
Landform: low center polygon
Element: center
Parent material: organic mat over organic rich lacustrine sediment
Relief: < 1 m
Slope: < 1 percent
Notes: Polygon area = 189 m^2; center element = 115 m^2 (61%);
$T_{air} = 6^oC$; $T_{10\ cm} = 6^oC$;
lab data included in Appendix B, pp. 134, 135 and 142

Horizon and Depth (cm)		Description
01	0-25	Very dark grayish brown (10YR 3/2) intermediately decomposed sedge material; moderate medium platy structure (4 mm thick); mildly alkaline; strongly effervescent; many roots; abrupt wavy boundary ss 3718
IIC1	25-41	Very dark grayish brown (10YR 3/2) loam; moderate coarse platy structure; firm; mildly alkaline; strongly effervescent; est. 7 percent gravel; few roots; abrupt smooth boundary ss 3719
IIC2f	41-56	Very dark grayish brown (10YR 3/2) organic rich silt; considerable plant fragment content; mildly alkaline; strongly effervescent; est. 1 percent gravel; frozen ss 3720

Collected by: R. Parkinson
Weather: sunny, cool
Date: 7/22/75

Site: P-8F
Location: NW ¼, SW ¼, Sec. 20, T. 11N., R. 14E.
Classification: Pergelic Cryofibrist, euic
Landform: aligned ridge terrain
Element: basin flat
Parent material: organic mat overlying lacustrine sediment
Relief: macro < 1 m; micro = 18 cm
Slope: < 1 percent
Notes: Water table at 8 cm; $T_{10\ cm} = 5^{o}C$; Carex aquatilis, moss; lab data included in Appendix B, pp. 135 and 142

Horizon and Depth (cm)		Description
Oil	0-29	Dark brown (10YR 4/3) and very dark grayish brown (10YR 3/2) fibric sedge material; about 90 percent fiber, 85 percent after rubbing; weak medium platy structure (5 mm); nonsticky; considerable silt loam mineral content; yellowish red (5YR 4/6) ferric band at base of moss and some discontinuous grayish brown (10YR 5/2) carbonate coats at the surface; moderately alkaline; slightly effervescent; many roots; abrupt smooth boundary ss 3721
IIC1	29-36	Very dark grayish brown (10YR 3/2) fine sandy loam; weak coarse platy structure (12 mm); nonsticky; neutral; slightly effervescent; est. 4 percent gravel; few roots; abrupt smooth boundary ss 3722
IIOalf	36-52	Very dark grayish brown (10YR 3/2) sapric material; about 10 percent fibers, less than 5 percent after rubbing; appreciable silt loam content; moderately alkaline; slightly effervescent; est. 2 percent gravel; frozen ss 3723

Collected by: R. Parkinson
Weather: sunny, cool
Date: 7/23/75

Site: P-8R
Location: NW ¼, SW ¼, Sec. 20, T. 11N., R. 14E.
Classification: Histic Pergelic Cryaquept, loamy, mixed (calcareous)
Landform: aligned ridge terrain
Element: ridge
Parent material: organic material over lacustrine sediment
Slope: < 1 percent
Notes: Two 10 m transects conducted to determine areal extent of ridge
Transect 1: basin flats = 68 percent; ridges = 32 percent
Transect 2: basin flats = 82 percent; ridges = 18 percent
Lab data included in Appendix B, pp. 135 and 142

Horizon and Depth (cm)		Description
O11	25-22	Moss, lichen mat; mostly undecomposed; not sampled
O21	22-17	Very dark grayish brown (10YR 3/2) finely divided organic matter; about 20 percent fiber; 10 percent after rubbing; weak fine granular structure; friable; grayish brown (10YR 5/2) carbonate band (5 mm thick) overlying yellowish red (5YR 4/6) ferric band (6 mm thick) at base of horizon; appreciable silt loam content; mildly alkaline; strong effervescence; common roots; clear wavy boundary ss 3725
O12	17-0	Very dark brown (10YR 2/2) mat of intermediately decomposed sedge roots and stems; about 60 percent fibers, 35 percent after rubbing; weak medium platy structure (5 mm thick); nonsticky; mildly alkaline; appreciable silt content; many roots; abrupt wavy boundary ss 3726
IIC1	0-8	Dark gray (5Y 4/1) fine sandy loam; weak very coarse platy structure; slightly sticky; neutral; slight effervescence; est. 7 percent gravel; few roots; abrupt smooth boundary ss 3727
IIC2f	8-42	Dark grayish brown (2.5Y 4/2) silt loam with dark gray (5Y 4/1) fine sandy loam and very dark brown (10YR 2/2) organic rich inclusions; moderately alkaline; slight effervescence; est. 5 percent gravel; frozen ss 3728

Collected by: R. Parkinson
Weather: sunny, cool
Date: 7/23/75

Site: P-9
Location: SW ¼, NW ¼, Sec. 23, T. 11N., R. 15E.
Classification: Pergelic Cryopsamment, mixed
Landform: longitudinal and barchan sand dune field
Element: eroding sand dune
Parent material: Eolian sand derived from Sagavanirktok River Delta
Relief: 1-2.5 m
Slope: dunes exhibit sloping sides and gently sloping tops
Vegetation: Elymus root system; surface devoid of vegetation
Notes: Dune field located on leeward side of the Sagavanirktok River Delta.
$T_{air} = 2^{o}C$; $T_{10\ cm} = 6^{o}C$; permafrost table at 76 cm;
Lab data included in Appendix B, pp. 135, 142 and 143

Horizon and Depth (cm)		Description
C1	0-30	Dark grayish brown (2.5Y 4/2) fine sand; single grain; loose; neutral; strong effervescence; common roots; gradual smooth boundary ss 3729
C2	30-76	Dark grayish brown (2.5Y 4/2) fine sand; single grain; loose; moderately alkaline; strong effervescence; few roots; abrupt smooth boundary ss 3730

Collected by: R. Parkinson
Weather: cloudy, windy, snow flurries
Date: 7/24/75

Site: P14
Location: SW ¼, SW ¼, Sec. 20, T. 10N., R. 15E.
Classification: Pergelic Cryorthent, sandy-skeletal, mixed
Landform: floodplain-Sagavanirktok River
Parent material: alluvium
Relief: < 1 m
Slope: < 1 percent
Notes: Floodplain was being extensively mined for construction aggregate; pedon located in a slightly concave position; $T_{air} = 5^{o}C$; $T_{10\ cm} = 4^{o}C$; no free water in pit; lab data included in Appendix B, pp. 135, 136 and 143

Horizon and Depth (cm)		Description
C1	0-8	Dark grayish brown (2.5Y 4/2) very fine sandy loam interbedded with lenses of fine and medium sand; depositional platy structure; common medium distinct yellowish red (5YR 5/8) and few fine distinct yellowish brown (10YR 5/4) mottles; very friable; mildly alkaline; strong effervescence; est. 2 percent gravel; common roots; abrupt smooth boundary ss 3748
C2	8-18	Dark grayish brown (2.5Y 4/2) silt loam; moderate medium platy depositional structure; few fine distinct strong brown (7.5YR 5/6) mottles; discontinuous very dark brown (10YR 2/2) bands of organic residue (3 mm thick) occurring at 6 mm depth intervals; friable; moderately alkaline; strong effervescence; few roots; abrupt smooth boundary ss 3749
IIC3	18-25	Dark grayish brown (2.5Y 4/2) fine sandy loam; weak coarse platy depositional structure; very friable; moderately alkaline; strong effervescence; est. 3 percent gravel; few roots; abrupt smooth boundary ss 3750
IIIC4	25-50	Dark grayish brown (10YR 4/2) very gravelly coarse sand; single grain; loose; mildly alkaline; strong effervescence; est. 55 percent gravel; abrupt smooth boundary ss 3751
IIIC5f	50-75	Dark grayish brown (10YR 4/2) very gravelly coarse sand; moderately alkaline; strong effervescence; est. 55 percent gravel; frozen ss 3752

Collected by: K. Everett
R. Parkinson
Weather: cloudy, cool
Date: 8/3/75

Site: P-15 IH
Location: SW ¼, SW ¼, Sec. 15, T. 11N., R. 13E.
Classification: Pergelic Cryosaprist, euic
Landform: high center polygon
Element: center (interhummock position)
Parent material: decomposed sedge material and/or organic rich lacustrine sediment
Relief: macro = 38 cm
Slope: 1 percent
Vegetation: moss, _Dryas integrifolia_, _Salix reticulata_, _Carex_ spp.
Notes: polygon area = 19 m^2; center element = 16 m^2 (84%)
$T_{air} = 10^oC$; $T_{10\ cm} = 3^oC$;
lab data included in Appendix B, pp. 136 and 143

Horizon and Depth (cm)		Description
Oi1	0-2	Mat of mosses and sedges
Oa1	2-10	Dark brown (7.5YR 3/2) sapric material; about 10 percent fibers, 5 percent after rubbing; weak very fine granular structure; friable; mildly alkaline; appreciable silt content; common roots; abrupt smooth boundary ss 3754
Oa2	10-20	Vark dark grayish brown (10YR 3/2) sapric material; about 5 percent fibers and a trace after rubbing; weak to moderate fine granular structure; friable; common medium distinct yellowish red (5YR 5/8) mottles; mildly alkaline; appreciable silt content; few roots; clear smooth boundary ss 3755
Oa3	20-27	Very dark grayish brown (10YR 3/2) sapric material; about 5 percent fibers and a trace after rubbing; weak fine granular structure; friable; neutral; appreciable silt content; few roots; abrupt smooth boundary ss 3756
Oa4f	27-52 27/25	Very dark grayish brown (10YR 3/2) sapric material; about 5 percent fibers and a trace after rubbing; neutral; appreciable silt content; frozen ss 3757

Collected by: K. Everett
R. Parkinson

Weather: sunny, mild
Date: 8/4/75

Site: P-15T
Location: SW ¼, SW ¼, Sec. 15, T. 11N., R. 13E.
Classification: Histic Pergelic Cryaquept, loamy, mixed (calcareous)
Landform: high center polygon
Element: trough
Parent material: organic moss and sedge mat overlying organic rich lacustrine sediment
Relief: macro = 38 cm
Notes: polygon area = 19 m^2; trough element = 3 m^2 (16%); T_{air} = 10^oC; lab data included in Appendix B, pp. 136 and 143

Horizon and Depth (cm)		Description
01	18-13	Yellowish brown (10YR 5/6) fibrous moss and sedge material; about 85 percent fiber, 80 percent after rubbing; massive; nonsticky; mildly alkaline; slight effervescence; abrupt irregular boundary ss 3758
02	13-10	Very dark brown (10YR 2/2) finely divided organic matter; about 40 percent fiber; 20 percent after rubbing; weak coarse platy parting to weak very fine granular structure; nonsticky; neutral; appreciable silt loam content; abrupt smooth boundary ss 3759
IIC1f	0-25	Very dark grayish brown (10YR 3/2) silt loam; less than 10 percent organic fragments and a trace after rubbing; mildly alkaline; slight effervescence; frozen ss 3760

Collected by: K. Everett
R. Parkinson

Weather: sunny, mild
Date: 8/4/75

Site: P-16E
Location: SE ¼, SE ¼, Sec. 32, T. 11N., R. 14E.
Landform: thaw lake basin (drained)
Element: basin edge
Parent material: Peat blocks from sloughing shore, interbedded with sands and organic rich lacustrine sediment
Relief: 0.5 m (lake bottom-land surface)
Slope: 2 percent
Vegetation: none
Notes: thaw lake artifically drained (1973); transect conducted along lake basin; pit located 3.10 m from lake edge; convex slope along periphery of lake bottom, 5.10 m in length; lab data included in Appendix B, pp. 136 and 143

Strata	Depth (cm)	Description	
Oe1	0-8	Very dark brown (10YR 2/2) hemic material composed of sedge; about 45 percent fibers; 25 percent after rubbing; weak medium platy structure; mildly alkaline; slight effervescence; grayish brown (10YR 5/2) medium sand lense at 0 cm depth (1 mm thick); appreciable silt content; many roots; abrupt smooth boundary	ss 3761
C1	8-13	Grayish brown (10YR 5/2) sand; very weak medium platy structure; very friable; appreciable plant fragment content (primarily sedge); mildly alkaline; strong effervescence; abrupt wavy boundary	ss 3762
Oe2	13-41	Very dark brown (10YR 2/2) hemic sedge material; about 40 percent fiber, 20 percent after rubbing; weak medium platy structure; appreciable silt content; neutral; gradual wavy boundary	ss 3763
Oa1f	41-66	Very dark brown (10YR 2/2) sapric material; about 20 percent fibers, less than 10 percent after rubbing; slightly acid; sampled mainly from upper 13 cm	ss 3764

Collected by: R. Parkinson
Weather: cloudy, windy, light snow flurries
Date: 8/7/75

Site: pit 2, P-16
Location: SE ¼, SE ¼, Sec. 32, T. 11N., R. 14E.
Landform: thaw lake basin (recently drained)
Element: lake flat
Parent material: organic rich lacustrine sediment and sedge peat
Relief: 1.0 m (lake bottom-land surface)
Slope: < 1 percent
Vegetation: none
Notes: pit located along basin transect, 0.60 m from convex slope grading to edge of lake (2% slope); pit located 5.70 m from edge of lake; surficial cracking weakly expressed (1 cm wide); permafrost table at 50 cm

Strata	Depth (cm)	Description
Oal	0-15	Very dark brown (10YR 3/2) silty sapric material about 10 percent fibers and a trace after rubbing (10 cm thick) interbedded with grayish brown (10YR 5/2) fine and medium sand lenses (5 cm thick); slight effervescence; abrupt smooth boundary
Oel	15-28	Very dark brown (10YR 2/2) hemic material composed of sedge; about 40 percent fibers, 20 percent after rubbing; weak medium platy structure; appears relatively undisturbed; appreciable silt loam content; slight effervescence; abrupt smooth boundary

Site: pit 3, P-16
Location: SE ¼, SE ¼, Sec. 32, T. 11N., R. 14E.
Landform: thaw lake basin (recently drained)
Element: lake flat
Parent material: organic rich lacustrine sediment and sedge peat
Relief: 1.0 m
Slope: 0 percent
Vegetation: none
Notes: pit located along basin transect, 15.30 m from lake edge; surface cracking of 2.5 cm width at 12.70 m from edge of lake; permafrost table at 41 cm

Strata	Depth (cm)	Description
Oa1	0-8	Very dark grayish brown (10YR 3/2) silty sapric material; about 15 percent fibers, less than 5 percent after rubbing; weak medium platy structure; very friable; appreciable silt content; abrupt smooth boundary
C1	8-13	Grayish brown (10YR 5/2) sand; very weak medium platy structure; very friable; few plant fragments; abrupt smooth boundary
Oa2	13-23	Very dark brown (10YR 2/2) sapric material; about 20 percent fiber, 10 percent after rubbing; weak coarse platy structure; appreciable silt loam content; est. 2 percent gravel; abrupt wavy boundary
C2	23-28	Grayish brown (10YR 5/2) sand; very weak medium platy structure; very friable; common organic fragments; abrupt wavy boundary
Oe1	28-36	Very dark brown (10YR 2/2) hemic material composed of sedge; about 40 percent fibers; 25 percent after rubbing; weak medium platy structure; appreciable silt loam content; many organic fragments; clear smooth boundary
Oa3	36-41	Black (10YR 2/1) sapric material; about 25 percent fibers, 10 percent after rubbing; weak medium platy structure; abrupt smooth boundary

Described by: R. Parkinson
Weather: cloudy, windy, light snow flurries
Date: 8/7/75

Site: pit 4, P-16
Location: SE ¼, SE ¼, Sec. 32, T. 11N., R. 14E.
Landform: thaw lake basin (recently drained)
Element: lake flat
Parent material: organic rich lacustrine sediment and sedge peat
Relief: 1.0 m (lake bottom-land surface)
Slope: 0 percent
Vegetation: none
Notes: pit located along basin transect, 28.90 m from lake edge. Surficial cracks well expressed, approach 4 cm width; permafrost table at 36 cm

Strata	Depth (cm)	Description
Oa1	0-18	Very dark grayish brown (10YR 3/2) silty sapric material; less than 5 percent fibers and a trace after rubbing; weak coarse platy structure (6 mm thick); very friable; slight effervescence; few organic fragments; abrupt wavy boundary
C1	18-20	Stratified grayish brown (10YR 5/2) silt loam and sand; weak medium platy structure (4 mm thick); very friable; slight effervescence; few organic fragments; abrupt wavy boundary
Oe1	20-36	Very dark brown (10YR 2/2) hemic material composed of sedge; about 45 percent fibers, 25 percent after rubbing; moderate very coarse platy (25 mm thick) parting to weak fine platy structure (3 mm thick); appreciable silt loam content; many roots; abrupt smooth boundary

Described by : R. Parkinson
Weather: cloudy, windy, light snow flurries
Date: 8/7/75

Site: pit 5, P-16
Location: SE ¼, SE ¼, Sec. 32, T. 11N., R. 14E.
Landform: thaw lake basin (recently drained)
Element: lake flat
Parent material: organic rich lacustrine sediment overlying sand
Relief: 1.0 m (lake bottom-land surface)
Slope: 0 percent
Vegetation: none
Notes: pit located along basin transect, 39.20 m from lake edge; well expressed polygonal cracks, 4 cm wide at surface; permafrost table at 41 cm.

Strata	Depth (cm)	Description
Oal	0-25	Very dark grayish brown (10YR 3/2) silty sapric material; less than 2 percent fibers and a trace after rubbing; weak very coarse platy structure; very friable; common vesicles; appreciable silt loam content; strong effervescence; est. 2 percent gravel; abrupt smooth boundary
Cl	25-41	Dark gray (5Y 4/1) loamy fine sand; very weak very coarse platy structure; very friable; strong effervescence; est. 10 percent gravel; no organic fragments; abrupt smooth boundary

Described by: R. Parkinson
Weather: cloudy, windy, light snow flurries
Date: 8/7/75

Site: P-16F
Location: SE ¼, SE ¼, Sec. 32, T. 11N., R. 14E.
Landform: thaw lake basin
Element: lake flat
Parent material: organic rich lacustrine sediment overlying sand
Relief: 1.0 m (lake bottom-land surface)
Slope: 0 percent
Vegetation: none
Notes: pit located in central portion of lake; polygonal cracking, 5 cm wide at surface; distance from lake edge = 83.5 m; lab data included in Appendix B, pp. 136 and 143

Strata	Depth (cm)	Description
Oa1	0-28	Very dark grayish brown (10YR 3/2) silty sapric material; less than 2 percent fibers and a trace after rubbing; weak very coarse platy structure (30 mm thick); friable; mildly alkaline; strong effervescence; abrupt wavy boundary ss 3765
C1	28-36	Interbedded lenses of very dark brown (10 YR 2/2) hemic sedge material, grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) silty sapric material and dark gray (5Y 4/1) loamy fine sand; moderately alkaline; strong effervescence; abrupt irregular boundary
C2	36-46	Dark gray (5Y 4/1) loamy fine sand; single grain; loose; moderately alkaline; strong effervescence; abrupt smooth boundary
C3f	46-70	Dark gray (5Y 4/1) loamy fine sand; moderately alkaline; strong effervescence; frozen ss 3766

Collected by: R. Parkinson
Weather: cloudy, windy, light snow flurries
Date: 8/7/75

Site: P-17T
Location: SW ¼, SW ¼, Sec. 25, T. 11N., R. 13E.
Classification: Pergelic Cryosaprist, euic
Landform: low center polygon
Element: trough
Parent material: organic sedge overlying organic rich lacustrine sediment
Relief: macro < 1 m; micro = 25 cm
Slope: 1 percent
Vegetation: Carex aquatilis, moss
Notes: polygon area = 236 m^2; trough element = 16 m^2 (7%) trough element varied in width 50-61 cm; $T_{10\ cm} = 2^{o}C$; lab data included in Appendix B, pp. 136 and 143

Horizon and Depth (cm)		Description
Oe1	0-20	Very dark brown (10YR 2/2) hemic material composed of sedge; about 50 percent fibers, 30 percent after rubbing; weak medium platy structure (4 mm thick); nonsticky; appreciable silt content; mildly alkaline; slight effervescence; many roots; abrupt smooth boundary ss 3767
IIC1	20-30	Very dark grayish brown (10YR 3/2) silt loam; weak coarse platy structure (8 mm thick); slightly sticky; mildly alkaline; slight effervescence; est. 5 percent gravel; few roots; abrupt smooth boundary ss 3768
IIOa1f	30-52	Very dark brown (10YR 2/2) sapric material; about 20 percent fibers, 8 percent after rubbing; appreciable silt content; mildly alkaline; slight effervescence; frozen ss 3769

Collected by: R. Parkinson
Weather: cloudy, windy, snow flurries
Date: 8/7/75

Site: P-17R
Location: SW ¼, SW ¼, Sec. 25, T. 11N., R. 13E.
Classification: Pergelic Cryosaprist, euic
Landform: low center polygon
Element: rim
Parent material: organic sedge overlying organic rich lacustrine sediment
Relief: macro < 1 m; micro = 25 cm
Slope: 1 percent
Vegetation: <u>Eriophorum</u> <u>vaginatum</u>, <u>Dryas</u> spp, <u>Saxifraga</u> spp, crustose lichens, mosses
Notes: polygon area = 236 m^2, rim element = 91 m^2 (38%); rim width = 1.60 m; height = 25 cm; lab data included in Appendix B, pp. 136 and 144

Horizon and Depth (cm)		Description
Oa1	0-5	Very dark brown (10YR 2/2) sapric material; about 20 percent fibers, 5 percent after rubbing; weak very fine granular structure; friable; appreciable silt content; mildly alkaline; strong effervescence; common roots; abrupt smooth boundary ss 3771
A1cair	5-6.5	Band of grayish brown (10YR 5/2) organic rich silt overlying yellowish red (5Y 4/6) silt band; about 25 percent fibers, 10 percent after rubbing; weak very fine granular structure; friable; appreciable carbonate content; mildly alkaline; strong effervescence; common roots; abrupt smooth boundary ss 3772
Oe1	6.5-18	Very dark brown (10YR 2/2) hemic material composed of sedge; about 65 percent fibers, 40 percent after rubbing; weak medium platy structure; nonsticky; appreciable silt loam content; neutral; slight effervescence; many roots; abrupt smooth boundary ss 3773
IIC1	18-33	Very dark grayish brown (10YR 3/2) silt loam; weak coarse platy structure; slightly sticky; mildly alkaline; strong effervescence; est. 7 percent gravel; few roots; abrupt smooth boundary ss 3774

IIOa2f	33-53	Very dark brown (10YR 2/2) sapric material; about 10 percent fibers, less than 5 percent after rubbing; appreciable silt loam content; mildly alkaline; slight effervescence; est. 1 percent gravel; frozen ss 3775

Collected by: R. Parkinson
Weather: cloudy, windy, snow flurries
Date: 8/7/75

Site: P-17C
Location: SW ¼, SW ¼, Sec. 25, T. 11N., R. 13E.
Classification: Pergelic Cryohemist, euic
Landform: low center polygon
Element: center
Parent material: organic sedge overlying organic rich lacustrine sediment
Relief: macro < 1 m; micro = 25 cm
Slope: 1 percent
Notes: polygon area = 236 m^2; center element = 129 m^2 (55%); lab data included in Appendix B, pp. 137 and 144

Horizon	and Depth (cm)	Description
Oe1	0-10	Very dark grayish brown (10YR 3/2) hemic material composed of sedge; about 60 percent fibers, 35 percent after rubbing; weak medium platy structure (4 mm thick); nonsticky; light gray (10YR 7/2) band of carbonates at 0 cm and grayish brown (10YR 5/2) band of carbonates at 10 cm; appreciable silt content; neutral; slight effervescence; many roots; clear smooth boundary ss 3776
Oe2	10-23	Very dark grayish brown (10YR 3/2) hemic material composed of sedge; about 55 percent fibers, 30 percent after rubbing; moderate medium platy structure (5 mm thick); nonsticky; appreciable silt contant; mildly alkaline; slight effervescence; many roots; abrupt smooth boundary ss 3777
IIC1	23-36	Very dark grayish brown (10YR 3/2) organic rich loam; weak very coarse platy structure; slightly sticky; neutral; est. 5 percent gravel; few roots; abrupt smooth boundary ss 3778
IIC2f	36-43	Very dark grayish brown (10YR 3/2) silt loam; neutral; est. 3 percent gravel; frozen ss 3779
IIOa1f	43-61	Very dark brown (10YR 2/2) sapric material; less than 10 percent fibers and a trace after rubbing; neutral; est. 2 percent gravel; frozen ss 3780

Collected by: R. Parkinson
Weather: cloudy, windy, rainy
Date: 8/8/75

Site: P-17H
Location: SW ¼, SW ¼, Sec. 25, T. 11N., R. 13E.
Classification: Pergelic Cryohemist, euic
Landform: low center polygon
Element: center (hummock position)
Parent material: organic sedge overlying organic rich lacustrine sediment
Relief: macro < 1 m; micro = 10 cm
Slope: 1 percent
Vegetation: Eriophorum vaginatum, Salix arctica, mosses
Notes: polygon area = 236 m^2; center element = 129 m^2 (55%); hummock area = 13 m^2 (10%); pit about 1.5 m from P-17C; hummock 10 cm high; lab data included in Appendix B, pp. 137 and 144

Horizon	and Depth (cm)	Description
Oe1	0-5	Very dark brown (10YR 2/2) hemic material composed of mosses with some sedge; about 65 percent fibers, 40 percent after rubbing; massive; nonsticky; neutral; slight effervescence; common roots; clear smooth boundary ss 3781
Oe2	5-11	Very dark grayish brown (10YR 3/2) hemic material composed of sedge with some moss; about 60 percent fibers, 40 percent after rubbing; weak medium platy structure; nonsticky; appreciable silt content; neutral; slight effervescence; many roots; clear smooth boundary ss 3782
Oe3	11-26	Very dark grayish brown (10YR 3/2) hemic material composed of sedge; about 55 percent fibers; 35 percent after rubbing; weak medium platy structure; nonsticky; appreciable silt content; light gray (10YR 7/2) carbonate band at 13 cm; neutral; slight effervescence; many roots; abrupt smooth boundary ss 3783
IIC1	26-43	Very dark grayish brown (10YR 3/2) fine sandy loam; weak coarse platy structure (8 mm thick); slightly sticky; neutral; slight effervescence; est. 4 percent gravel; few roots; abrupt smooth boundary ss 3784
IIOalf	43-51	Very dark grayish brown (10YR 3/2) sapric material; about 10 percent fibers, less than 5 percent rubbed; neutral; slight effervescence; est. 2 percent gravel; frozen ss 3785

IIOa2f	51-61	Very dark brown (10YR 2/2) sapric material; about 15 percent fibers, 5 percent after rubbing; appreciable silt loam content; neutral; est. 1 percent gravel; frozen

ss 3786

Collected by: R. Parkinson
Weather: cloudy, windy, rainy
Date: 8/8/75

Site: P-18H
Location: NW ¼, SW ¼, Sec. 8, T. 11N., R. 13E.
Classification: Pergelic Cryoboroll, sandy, mixed
Landform: nonsorted net (earth hummock) on dissection slope
Element: hummock
Parent material: organic rich lacustrine sediment overlying Gubik Formation sediment
Relief: macro = 2 m; micro = 15 cm
Slope: 28 percent
Vegetation: Dryas integrifolia, lichens
Notes: slope length = 8 m; $T_{air} = 6^{o}C$; $T_{10\ cm} = 4^{o}C$; lab data included in Appendix B, pp. 137 and 144

Horizon and Depth (cm)		Description
A1	0-20	Very dark brown (10YR 2/2) silt loam; weak coarse platy parting to moderate fine granular structure; friable; neutral; 3 percent gravel; common roots; 30 percent inclusion of 10 YR 3/2 silt loam; abrupt wavy boundary ss 3787
C1ca	20-33	Dark grayish brown (2.5Y 4/2) fine sandy loam; weak medium platy parting to weak fine granular structure; few light gray (10YR 7/2) carbonate precipitates along root channels; mildly alkaline; strong effervescence; 5 percent gravel; few roots; clear smooth boundary ss 3788
IIC2ca	33-53	Dark grayish brown (2.5Y 4/2) fine sandy loam; single grain; loose; medium patchy dark grayish brown (2.5Y 4/2) silt coatings on upper sides of gravel; moderately alkaline; strong effervescence; 13 percent gravel; no roots; abrupt wavy boundary ss 3789
IIIC3ca	53-64	Dark grayish brown (2.5Y 4/2) gravelly loamy sand; single grain; loose; medium patchy dark grayish brown (2.5Y 4/2) silt coatings on upper sides of gravel; moderately alkaline; strong effervescence; est. 42 percent gravel; abrupt smooth boundary ss 3790
IVC4f	64-89	Dark grayish brown (2.5Y 4/2) gravelly sand; single grain; loose; mildly alkaline; slight effervescence; est. 20 percent gravel; frozen ss 3791

Collected by: R. Parkinson
Weather: cloudy, cool, drizzle
Date: 8/9/75

Site: P-18IH
Location: NW $\frac{1}{4}$, SW $\frac{1}{4}$, Sec. 8, T. 11N., R. 13E.
Classification: Pergelic Cryoboroll, sandy, mixed
Landform: nonsorted net (earth hummock) on dissection slope
Element: interhummock
Parent material: organic rich lacustrine sediment overlying Gubik Formation sediment
Relief: macro = 2 m; micro = 15 cm
Slope: 28 percent
Vegetation: *Dryas integrifolia*, lichens
Notes: Permafrost table at 53 cm; interhummock elements range in width from 12 to 18 cm;
lab data for C1ca horizon included in Appendix B, pp. 137 and 144

Horizon	and Depth (cm)	Description
A1	0-10	Very dark brown (10YR 2/2) silt loam; weak coarse platy parting to moderate fine granular structure; friable; neutral; few roots; abrupt wavy boundary
C1ca	10-23	Dark grayish brown (2.5Y 4/2) fine sandy loam; weak medium platy parting to weak fine granular structure; very friable; 15 percent inclusion of A1 material; moderately alkaline; strong effervescence; est. 4 percent gravel; few roots; clear smooth boundary ss 3792
IIC2ca	23-43	Dark grayish brown (2.5Y 4/2) gravelly fine sandy loam; single grain; loose; medium patchy dark grayish brown (2.5Y 4/2) silt coatings on upper sides of gravel; moderately alkaline; strong effervescence; est. 17 percent gravel; no roots; abrupt wavy boundary
IIIC3ca	43-53	Dark grayish brown (2.5Y 4/2) very gravelly loamy sand; single grain; loose; medium patchy dark grayish brown (2.5Y 4/2) silt coatings on upper sides of gravel; moderately alkaline; strong effervescence; est. 55 percent gravel; abrupt smooth boundary

Collected by: R. Parkinson
Weather: cloudy, cool, drizzle
Date: 8/9/75

Site: P-19F
Location: SW ¼, NW ¼, Sec. 13, T. 11N., R. 13E.
Classification: Pergelic Cryofibrist, euic
Landform: aligned ridge terrain
Parent material: organic material overlying lacustrine sediment
Relief: macro < 1 m; micro = 15 cm
Slope: 0 percent
Vegetation: Scorpidium scorpioides, Carex aquatilis and scattered Pedicularis spp
Notes: $T_{air} = 6^{o}C$; $T_{10\ cm} = 4^{o}C$; water table at surface; lab data included in Appendix B, pp. 137 and 145

Horizon	Depth (cm)	Description
Oi1	0-23	Dark yellowish brown (10YR 3/4) unrubbed, very dark grayish brown (10YR 3/2) rubbed fibric material composed of sedge; about 85 percent fibers, 80 percent after rubbing; weak coarse platy structure (6 mm thick); nonsticky; neutral; slight effervescence at surface; many roots; abrupt smooth boundary ss 3793
IIC1	23-33	Dark gray (N 4/) fine sandy loam; weak coarse platy structure; slightly sticky; moderately alkaline; strong effervescence; est. 7 percent gravel; few roots; abrupt smooth boundary ss 3794
IIOi2f	33-51	Very dark grayish brown (10YR 3/2) fibric material composed of sedge; about 80 percent fibers, 75 percent after rubbing; sand lenses at lower depths; neutral; slight effervescence; est. 1 percent gravel; frozen ss 3795

Collected by: R. Parkinson
Weather: cloudy, cool, drizzle
Date: 8/9/75

Site: P-20C
Location: SW ¼, SE ¼, Sec. 4, T. 11N., R. 13E.
Classification: Pergelic Cryosaprist, euic
Landform: low center polygon
Element: center
Parent material: organic mat overlying organic rich lacustrine sediment
Relief: macro < 1 m; micro = 18 cm
Slope: 1 percent
Vegetation: Carex spp, mosses
Notes: Polygon area = 201 m^2; Center element = 143 m^2 (72%); Polygon diameter = 14.20 m; Rim width ranged from 0.65 m to 0.80 m; ree water at bottom of pit; T_{air} = 0°C; lab data included in Appendix B, p. 145

Horizon	and Depth (cm)	Description
Oe1	0-20	Very dark grayish brown (10YR 3/2) hemic material composed of sedge; about 55 percent fibers, 30 percent rubbed; weak coarse platy structure (6 mm thick); nonsticky; reddish brown (5YR 4/4) ferric band at 0 cm; strongly acid; many roots; abrupt smooth boundary ss 3796
IIOa1	20-28	Very dark grayish brown (10YR 3/2) silty sapric material; less than 2 percent fibers and a trace after rubbing; weak coarse platy structure (5 mm thick); slightly sticky; appreciable silt loam content; strongly acid; est. 1 percent gravel; few roots; abrupt smooth boundary ss 3797
IIOa2f	28-41	Very dark grayish brown (10YR 3/2) silty sapric material; about 8 percent fibers, less than 5 percent after rubbing; appreciable silt loam content; medium acid; frozen ss 3798

Collected by: R. Parkinson
Weather: cloudy, windy, snow
Date: 8/10/75

Site: P-20T
Location: SW ¼, SE ¼, Sec. 4, T. 11N., R. 13E.
Classification: Pergelic Cryosaprist, euic
Landform: low center polygon
Element: trough
Parent material: organic mat overlying organic rich lacustrine sediment
Relief: macro < 1 m; micro = 18 cm
Slope: 1 percent
Notes: Polygon area = 201 m^2; trough element = 17 m^2 (8%); T_{air} = 0^oC; free water at bottom of pit; lab data included in Appendix B, p. 145

Horizon and Depth (cm)		Description
Oe1	0-20	Very dark grayish brown (10YR 3/2) hemic material composed of sedge; about 50 percent fibers, 30 percent after rubbing; weak medium platy structure (4 mm thick); nonsticky; strongly acid; abrupt smooth boundary ss 3799
IIOa1	20-28	Very dark grayish brown (10YR 3/2) silty sapric material; less than 2 percent fibers and a trace after rubbing; weak coarse platy structure; slightly sticky; appreciable silt loam content; medium acid; est. 5 percent gravel; few roots; abrupt smooth boundary ss 3800
IIOa2f	28-41	Very dark grayish brown (10YR 3/2) silty sapric material; about 5 percent fibers and a trace after rubbing; appreciable silt loam content; medium acid; frozen ss 3801

Collected by: R. Parkinson
Weather: cloudy, windy, snow
Date: 8/10/75

Site P-20R
Location: SW ¼, SE ¼, Sec. 4, T. 11N., R. 13E.
Classification: Pergelic Cryosaprist, euic
Landform: low center polygon
Element: rim
Parent material: organic mat overlying organic rich lacustrine sediment
Relief: macro < 1 m; micro = 18 cm
Slope: 1 percent
Vegetation: <u>Dryas integrifolia</u>, <u>Thamnolia subuliformis</u>, <u>Dactlyna arctica</u>, <u>Salix reticulata</u>, sedges
Notes: Polygon area = 201 m^2, rim element = 41 m^2 (20%); rim width = 70 cm; rim height = 18 cm; lab data included in Appendix B, p. 145

Horizon	and Depth (cm)	Description
Oa1	0-8	Very dark grayish brown (10YR 3/2) sapric material; about 35 percent fibers, 15 percent after rubbing; weak medium platy parting to a weak fine granular structure; friable; slightly acid; common roots; abrupt wavy boundary ss 3802
Oe1	8-20	Dark brown (10YR 3/3) hemic material composed of sedge; about 55 percent fibers, 30 percent after rubbing; weak medium platy structure (4 mm thick); nonsticky; common dark yellowish brown (10YR 4/4) fibers; medium acid; many roots; abrupt smooth boundary ss 3803
IIOa2	20-30	Very dark grayish brown (10YR 3/2) silty sapric material; less than 2 percent fibers and a trace after rubbing; weak coarse platy structure; slightly sticky; appreciable silt loam content; medium acid; est. 5 percent gravel; few roots; abrupt smooth boundary ss 3804
IIOa3f	30-41	Very dark grayish brown (10YR 3/2) sapric material; about 5 percent fibers and a trace after rubbing; appreciable silt loam content; medium acid; frozen ss 3805

Collected by: R. Parkinson
Weather: cloudy, windy, snow
Date: 8/10/75

Site: P-22H
Location: NW ¼, NW ¼, Sec. 34, T. 11N., R. 14E.
Classification: Pergelic Cryoboroll, sandy-skeletal, mixed
Landform: nonsorted net (earth hummock) on a pingo
Element: hummock
Parent material: organic rich lacustrine sediment overlying Gubik Formation sediment
Relief: macro = 8 m; micro = 13 cm
Slope: 32 percent 18°
Vegetation: <u>Dryas integrifolia</u>, lichens
Notes: Hummock height = 13 cm; relatively shallow active layer probably due to overall low summer temperatures; lab data included in Appendix B, pp. 137, 138 and 145

Horizon and Depth (cm)			Description
A11ca	0-13	6	Dark brown (7.5YR 3/2) silt; moderate fine granular structure; friable; white (10 YR 8/2) carbonate filaments along root channels occupying about 10-15 percent of total volume; thin patchy white (10YR 8/2) carbonate coatings on undersides of gravel; mildly alkaline; strong effervescence; 5 percent gravel; common roots; clear broken boundary ss 3810
A12ca	13-25	19	Dark brown (7.5YR 3/2) silt; moderate fine granular structure; friable; white (10YR 8/2) carbonate filaments along channels occupying 5 percent of total volume; thin patchy white (10YR 8/2) carbonate coatings on undersides of gravel; about 20 percent gravel at base of horizon; moderately alkaline; strong effervescence; 7 percent gravel; few roots; abrupt smooth boundary ss 3811
IIC1ca	25-32	28	Dark grayish brown (2.5Y 4/2) very gravelly sandy loam; single grain; loose; thin patchy dark grayish brown (2.5Y 4/2) silt coatings on upper sides of gravel; thin patchy white (10YR 8/2) carbonate coatings on undersides of gravel; mean gravel diameter 1.0 cm; moderately alkaline; strong effervescence; 53 percent gravel; few roots; clear smooth boundary ss 3812

IIC2ca	32-48 40	Yellowish brown (10YR 5/6) very gravelly sand; single grain; loose; thin patchy dark brown (10YR 4/3) silt coatings on upper sides of gravel; medium continuous white (10YR 8/2) carbonate coatings on undersides of gravel; mean gravel diameter, 2.0 cm; moderately alkaline; strong effervescence; 54 percent gravel; few roots to 38 cm; clear smooth boundary ss 3813
IIIC3ca	48-58 57	Yellowish brown (10YR 5/4) sand; single grain; loose; thin patchy dark yellowish brown (10YR 4/4) silt coatings on upper sides of gravel; thin patchy white (10YR 8/2) carbonate coatings on undersides of gravel; mean gravel diameter, 1.0 cm; moderately alkaline; strong effervescence; 7 percent gravel; abrupt smooth boundary ss 3814
IVC4caf	58-83 71	Yellowish brown (10YR 5/4) very gravelly coarse sand; single grain; loose; thin very patchy dark yellowish brown (10YR 4/4) silt coatings on upper sides of gravel; thin patchy white (10YR 8/2) carbonate coatings on the undersides of gravel; mean gravel diameter, 2.0 cm; upper size of gravel fraction approaches 8 cm diameter (cobble size); temperature = $0^{\circ}C$; moderately alkaline; strong effervescence; 56 percent gravel ss 3815

Collected by: R. Parkinson
Weather: cloudy, windy, cool
Date: 8/11/75

Site: P-22IH
Location: NW ¼, NW ¼, Sec. 34, T. 11N., R. 14E.
Classification: Pergelic Cryoboroll, sandy-skeletal, mixed

Landform: nonsorted net (earth hummock) on pingo
Element: interhummock
Parent material: organic rich lacustrine sediment overlying Gubik Formation sediment
Relief: macro = 8 m; micro = 13 cm
Slope: 32 percent
Notes: interhummock width = 10 cm; $T_{air} = 2^{o}C$;
lab data for Alca horizon included in Appendix B. pp. 138 and 145

Horizon and Depth (cm)		Description
Alca	0-18	Dark brown (7.5YR 3/2) silt; moderate fine granular structure; friable; white (10YR 8/2) carbonate filaments occupying 5 percent by volume; thin patchy white (10YR 8/2) carbonate coatings on undersides of gravel; moderately alkaline; strong effervescence; est. 6 percent gravel; few roots; abrupt smooth boundary ss 3816
IIClca	18-25	Dark grayish brown (2.5Y 4/2) very gravelly sandy loam; single grain; loose; thin patchy dark grayish brown (2.5Y 4/2) silt coatings on upper sides of gravel; thin patchy white (10YR 8/2) carbonate coatings on undersides of gravel; mean gravel diameter, 1.0 cm; moderately alkaline; strong effervescence; 53 percent gravel; few roots; clear smooth boundary
IIC2ca	25-40	Yellowish brown (10YR 5/6) very gravelly sand; single grain; loose; thin patchy dark brown (10YR 4/3) silt coatings on upper sides of gravel; medium continuous white (10YR 8/2) carbonate coatings on undersides of gravel; mean gravel diameter, 2.0 cm; moderately alkaline; strong effervescence; 54 percent gravel; few roots to 30 cm, no roots below 30 cm; clear smooth boundary

IIIC3ca	40-50	Yellowish brown (10YR 5/4) sand; single grain; loose; thin patchy dark yellowish brown (10YR 4/4) silt coatings on upper sides of gravel; thin patchy white (10 YR 8/2) carbonate coatings on undersides of gravel; mean gravel diameter, 1.0 cm; moderately alkaline; strong effervescence; 7 percent gravel; abrupt smooth boundary
IVC4caf	50-75	Yellowish brown (10YR 5/4) very gravelly coarse sand; single grain; loose; thin very patchy dark yellowish brown (10YR 4/4) silt coatings on upper sides of gravel; thin patchy white (10YR 8/2) carbonate coatings on undersides of gravel; mean gravel diameter, 2.0 cm; upper size of gravel approaches 8 cm (cobble size); temperature = $0^{\circ}C$; moderately alkaline; strong effervescence; 56 percent gravel

Collected by: R. Parkinson
Weather: cloudy, windy, cool
Date: 8/11/75

APPENDIX B

PARTICLE SIZE DISTRIBUTION

SELECTED CHEMICAL PROPERTIES

PARTICLE SIZE DISTRIBUTION (PERCENT)

		Sand (mm)						Silt	Clay (μ)				
Sample No.	Horizon	Very Coarse 1-2	Coarse .5-1	Medium .25-.5	Fine .1-.25	Very Fine .05-.1	Total .05-2	Total Silt 2-50 (μ)	Fine <.2	Coarse .2-2	Total < 2	Textural Class	c/si
3177	A11ca	2.9	3.5	5.3	7.7	2.9	22.3	61.1	6.4	10.2	16.6	sil	.27
3178	A12ca	1.4	3.9	8.7	15.5	4.3	33.8	50.9	5.4	9.9	15.3	sil	.30
3179	IIC1	1.1	8.1	23.8	48.7	8.4	90.1	3.3	2.8	3.8	6.6	s	2.0
3180	IIC2ca	2.1	7.7	21.2	50.3	10.6	91.8	3.0	2.8	2.4	5.2	gfs	1.7
3181	IIC3ca	2.5	12.6	27.2	41.8	6.0	90.1	4.6	2.3	3.0	5.3	vgs	1.2
3182	IIC4	13.2	25.8	33.0	18.6	2.1	92.7	4.2	1.5	1.6	3.1	vgcos	0.74
3294	IIC5	6.9	28.0	42.3	18.4	1.9	97.6	0	0.5	1.9	2.4	gcos	—
3258	A1	0.0	0.9	1.5	7.9	12.9	23.2	67.0	2.8	7.0	9.8	sil	
3259	B2g	0.7	2.6	8.1	22.5	12.7	46.7	37.6	3.1	12.6	15.7	1	
3260	IIC1	2.3	3.8	5.6	11.4	5.8	29.0	54.1	-	-	16.9	sil	
3261	IIC2f	0.9	3.0	7.7	22.0	9.9	43.6	42.4	2.3	11.7	14.0	1	
3262	IIC3f	0.5	2.8	12.1	44.2	19.7	79.4	12.5	1.8	6.3	8.1	1fs	
3263	B2g	0.4	3.5	9.2	25.7	12.0	50.8	34.4	4.0	10.8	14.8	1	

PARTICLE SIZE DISTRIBUTION (PERCENT)

		Sand (mm)						Silt	Clay (μ)			
Sample No.	Horizon	Very Coarse 1-2	Coarse .5-1	Medium .25-.5	Fine .1-.25	Very Fine .05-.1	Total .05-2	Total Silt 2-50 (μ)	Fine <.2	Coarse .2-2	Total < 2	Textural Class
3264	IIC1	0.4	2.4	5.0	13.7	9.5	31.1	55.2	2.8	10.9	13.7	sil
3265	IIC2f	0.3	1.9	3.7	11.5	10.2	27.8	59.4	2.3	10.5	12.8	sil
3266	A11	1.9	1.5	1.4	5.2	14.6	24.8	66.4	1.2	7.6	8.8	sil
3267	A12	0.0	0.6	1.1	4.0	8.3	14.0	71.7	2.0	12.3	14.3	sil
3268	II021	0.2	0.6	1.2	3.6	4.3	10.0	74.3	3.3	12.4	15.7	sil
3269	II022	12.8	1.1	1.3	2.3	2.0	19.5	73.3	3.9	3.3	7.2	sil
3270	II023f	14.0	1.3	1.9	3.3	2.2	22.8	68.9	2.6	5.7	8.3	sil
3271	IIICf	1.6	5.4	14.2	41.6	16.8	79.6	12.8	4.2	3.4	7.6	ls
3272	01	0.0	0.2	1.4	7.2	10.6	19.5	70.0	3.1	7.4	10.5	sil
3273	IIC1	0.0	0.4	1.3	5.2	7.0	14.0	76.3	0.4	9.3	9.7	sil
3274	IIC2f	0.0	0.1	1.1	4.8	9.3	15.3	75.5	1.8	7.4	9.2	sil
3275	Oi1	0.0	0.2	1.2	9.0	24.9	35.3	57.9	0.3	6.5	6.8	sil
3276	Oi2	0.0	0.2	1.9	18.2	20.9	41.4	50.1	3.2	5.3	8.5	sil

PARTICLE SIZE DISTRIBUTION (PERCENT)

		Sand (mm)						Silt	Clay (μ)			
Sample No.	Horizon	Very Coarse 1-2	Coarse .5-1	Medium .25-.5	Fine .1-.25	Very Fine .05-.1	Total .05-2	Total Silt 2-50 (μ)	Fine <.2	Coarse .2-2	Total < 2	Textural Class
3277	Oi3	0.0	0.7	3.0	25.5	27.5	56.7	35.6	2.8	4.9	7.7	sl
3278	Oi4f	0.0	0.4	2.8	21.4	22.9	47.5	43.9	2.7	5.9	8.6	l
3279	A11	0.0	0.2	1.0	3.9	9.6	14.7	74.2	2.3	8.8	11.1	sil
3280	A12cair	0.0	0.4	1.6	5.4	9.6	17.0	66.1	4.8	12.1	16.9	sil
3281	Oe1	0.0	0.5	1.0	3.7	11.3	16.6	72.3	2.4	8.7	11.1	sil
3282	IIC1	0.4	3.7	8.6	17.5	5.8	36.1	50.2	3.4	10.3	13.7	sil
3283	IIOi1	0.0	0.5	5.3	18.6	6.2	30.6	59.1	2.0	8.3	10.3	sil
3284	IIOe2f	0.2	1.9	7.1	14.6	5.3	29.2	62.4	1.5	6.9	8.4	sil
3285	IIOe4f	0.0	0.7	3.2	8.9	7.5	20.4	68.3	1.6	9.7	11.3	sil

PARTICLE SIZE DISTRIBUTION (PERCENT)

		Sand (mm)						Silt (μ)			Clay (μ)			
Sample No.	Horizon	Very Coarse 1-2	Coarse .5-1	Medium .25-.5	Fine .1-.25	Very Fine .05-.1	Total .05-2	Fine 2-20	Coarse 20-50	Total 2-50	Fine <.2	Coarse .2-2	Total < 2	Textural Class
3671	A11	2.0	2.8	2.7	16.5	29.1	53.1	12.9	32.8	45.7	0.8	0.4	1.2	vfsl
3672	A12	1.2	2.1	2.2	10.2	23.7	39.4	25.3	32.2	57.5	1.1	2.0	3.1	sil
3673	IIC1	0.5	1.4	5.1	18.0	17.5	42.5	31.3	22.5	53.8	1.4	2.3	3.7	sil
3674	IIC2f	0.0	0.8	4.0	10.1	1.8	16.7	34.3	44.7	79.0	2.0	2.3	4.3	sil
3676	A11	0.0	0.1	0.4	6.8	4.3	11.6	8.4	76.3	84.7	2.6	1.1	3.7	si
3677	A12	1.0	2.0	1.6	9.1	13.1	26.8	14.8	55.2	70.0	1.9	1.3	3.2	sil
3678	A13	0.7	0.8	1.3	8.0	12.4	23.2	19.6	53.2	72.8	2.1	1.9	4.0	sil
3679	IIC1	0.0	1.0	5.0	14.3	8.5	28.8	32.0	31.3	63.3	3.0	4.9	7.9	sil
3680	IIC2f	0.0	0.8	4.6	14.0	7.7	27.1	34.2	30.1	64.3	3.0	5.6	8.6	sil
3682	A1	0.1	0.5	0.7	8.2	12.3	21.8	12.5	62.1	74.6	1.8	1.8	3.6	sil
3683	IIC1f	0.3	0.7	0.9	5.3	10.9	18.1	20.8	56.7	77.5	2.3	2.1	4.4	sil
3686	IIC1	0.6	5.1	15.7	27.0	4.8	53.2	16.1	17.4	33.5	2.8	10.5	13.3	fsl
3690	Oa2	0.1	0.3	0.7	11.3	3.8	16.2	8.5	72.1	80.6	2.1	1.1	3.2	si

PARTICLE SIZE DISTRIBUTION (PERCENT)

		Sand (mm)						Silt (µ)			Clay (µ)			
Sample No.	Horizon	Very Coarse 1-2	Coarse .5-1	Medium .25-.5	Fine .1-.25	Very Fine .05-.1	Total .05-2	Fine 2-20	Coarse 20-50	Total 2-50	Fine <.2	Coarse .2-2	Total < 2	Textural Class
3691	C1	0.0	0.1	1.6	42.3	17.8	61.8	8.2	27.4	35.6	1.8	0.8	2.6	fsl
3693	IIOa3	0.0	0.2	1.5	5.8	7.9	15.4	25.1	48.5	73.6	2.2	8.8	11.0	sil
3694	IIOa4f	0.4	2.9	7.8	13.7	5.4	30.2	23.4	31.7	55.1	2.8	11.9	14.7	sil
3696	IIC1	0.1	0.5	1.5	10.2	5.8	18.1	39.4	30.1	69.5	1.9	10.5	12.4	sil
3698	IIC1	0.2	2.2	5.5	15.8	7.4	31.1	27.7	28.8	56.5	2.4	10.0	12.4	sil
3702	IIC1	0.6	2.9	5.3	14.0	6.3	29.1	29.0	30.3	59.3	2.0	9.6	11.6	sil
3706	IIC1	1.3	3.1	6.7	12.8	5.6	29.5	26.3	37.1	63.4	1.6	5.5	7.1	sil
3710	C	19.7	22.3	22.9	21.9	6.1	92.9	3.5	0.9	4.4	1.7	1.0	2.7	vgcos
3711	Oa1	0.0	0.2	1.2	5.0	1.9	8.3	15.4	72.4	87.8	2.6	1.3	3.9	si
3712	Oe1	0.0	0.1	1.6	4.1	0.7	6.5	22.4	68.3	90.7	1.2	1.6	2.8	si
3713	IIOa2	0.0	0.8	3.0	6.1	1.0	10.9	19.9	65.9	85.8	1.9	1.4	3.3	si
3716	Oe1	0.0	0.2	1.1	3.2	1.1	5.6	19.3	72.7	92.0	1.8	0.6	2.4	si
3718	O1	0.0	0.2	1.6	5.0	2.7	9.5	22.7	57.0	79.7	1.3	9.5	10.8	sil

PARTICLE SIZE DISTRIBUTION (PERCENT)

		Sand (mm)						Silt (μ)			Clay (μ)			
Sample No.	Horizon	Very Coarse 1-2	Coarse .5-1	Medium .25-.5	Fine .1-.25	Very Fine .05-.1	Total .05-2	Fine 2-20	Coarse 20-50	Total 2-50	Fine <.2	Coarse .2-2	Total < 2	Textural Class
3719	IIC1	0.4	2.9	8.2	17.7	7.5	36.7	22.4	21.3	43.7	2.9	16.7	19.6	l
3720	IIC2f	0.1	1.1	2.5	4.6	0.9	9.2	21.6	65.3	86.9	2.0	1.9	3.9	si
3722	IIC1	0.3	3.7	13.4	36.3	13.8	67.5	10.8	9.3	20.1	1.2	11.2	12.4	fsl
3723	IIOalf	0.2	2.1	6.2	12.1	2.0	22.6	12.9	59.7	72.6	1.3	3.5	4.8	sil
3726	012	0.0	0.0	0.1	1.0	1.0	2.1	23.9	70.5	94.4	1.3	2.2	3.5	si
3727	IIC1	0.6	4.1	13.8	40.0	17.0	75.5	9.4	5.9	15.3	3.5	5.7	9.2	fsl
3728	IIC2f	0.3	2.8	9.7	20.7	4.3	37.8	15.1	41.9	57.0	2.4	2.8	5.2	sil
3729	C1	0.0	0.1	3.1	70.0	22.5	95.7	1.1	0.0	1.1	1.3	1.9	3.2	fs
3730	C2	0.1	0.3	3.1	61.6	29.1	94.2	1.0	1.0	2.0	2.5	1.3	3.8	fs
3748	C1	0.5	1.5	3.9	26.2	29.1	61.2	15.3	18.4	33.7	1.4	3.7	5.1	vfsl
3749	C2	0.8	0.4	1.2	7.3	17.2	26.9	31.8	34.6	66.4	1.8	4.9	6.7	sil
3750	IIC3	0.9	1.0	3.8	38.3	27.6	71.6	9.3	14.5	23.8	1.9	2.7	4.6	fsl
3751	IIIC4	14.4	18.7	24.6	20.4	9.2	87.3	5.6	4.1	9.7	1.5	1.5	3.0	vgcos

PARTICLE SIZE DISTRIBUTION (PERCENT)

		Sand (mm)						Silt (μ)			Clay (μ)			
Sample No.	Horizon	Very Coarse 1-2	Coarse .5-1	Medium .25-.5	Fine .1-.25	Very Fine .05-.1	Total .05-2	Fine 2-20	Coarse 20-50	Total 2-50	Fine <.2	Coarse .2-2	Total < 2	Textural Class
3752	IIIC5f	20.8	20.2	21.6	22.7	5.1	90.4	3.9	3.3	7.2	0.7	1.7	2.4	vgcos
3754	Oal	0.0	0.2	0.7	0.8	0.0	1.7	21.5	73.5	95.0	2.2	1.1	3.3	si
3759	O2	0.0	2.0	8.8	14.4	4.8	30.0	26.6	26.1	52.7	7.2	10.1	17.3	sil
3760	IIClf	0.0	4.4	6.8	9.8	2.3	23.3	20.2	52.0	72.2	2.0	2.5	4.5	sil
3762	Cl	0.1	4.2	26.1	55.0	7.2	92.6	3.0	2.4	5.4	1.1	0.9	2.0	fs
3765	Oal	0.0	0.3	1.3	4.0	2.6	8.2	43.1	38.4	81.5	1.4	8.9	10.3	si
3766	C3f	0.0	2.1	12.8	42.2	21.1	78.2	8.0	8.3	16.3	1.7	3.8	5.5	lfs
3768	IICl	0.7	2.9	6.6	19.6	7.6	37.4	26.7	25.7	52.4	2.5	7.7	10.2	sil
3769	IIOalf	0.0	0.5	1.3	3.7	0.7	6.2	22.0	68.2	90.2	1.3	2.3	3.6	si
3771	Oal	0.0	0.0	0.2	1.7	0.5	2.4	8.8	84.5	93.3	2.1	2.2	4.3	si
3772	Alcair	0.2	0.5	0.3	1.3	0.7	3.0	15.5	76.4	91.9	3.0	2.1	5.1	si
3774	IICl	0.6	2.8	7.7	21.1	5.5	37.7	22.6	32.2	54.8	1.2	6.3	7.5	sil
3775	IIOa2f	0.0	0.9	3.6	10.7	2.8	18.0	31.4	46.4	77.8	0.6	3.6	4.2	sil

PARTICLE SIZE DISTRIBUTION (PERCENT)

		Sand (mm)						Silt (μ)			Clay (μ)				
Sample No.	Horizon	Very Coarse 1-2	Coarse .5-1	Medium .25-.5	Fine .1-.25	Very Fine .05-.1	Total .05-2	Fine 2-20	Coarse 20-50	Total 2-50	Fine <.2	Coarse .2-2	Total < 2	Textural Class	
3776	Oel	0.0	0.0	0.2	1.7	0.5	2.4	12.7	82.5	95.2	1.7	0.7	2.4	si	
3778	IIC1	1.0	4.4	11.8	19.9	3.7	40.8	21.5	21.6	43.1	5.3	10.8	16.1	l	
3779	IIC2f	0.0	1.3	5.7	14.0	4.0	25.0	26.0	34.0	60.0	5.3	9.7	15.0	sil	
3784	IIC1	1.1	5.1	14.5	25.4	7.2	53.3	20.4	12.5	32.9	5.3	8.5	13.8	fsl	
3787	A1	0.5	1.9	6.3	12.7	5.7	27.1	21.5	38.5	60.0	4.5	8.4	12.9	sil	
3788	C1ca	0.7	5.2	17.4	39.0	10.7	73.0	8.4	5.7	14.1	5.1	7.8	12.9	fsl	
3789	IIC2ca	2.5	6.4	18.3	39.3	13.7	80.2	5.2	4.2	9.4	3.6	6.8	10.4	fsl	
3790	IIIC3ca	5.8	14.2	32.6	26.9	5.0	84.5	4.7	3.3	8.0	2.1	5.4	7.5	gls	
3791	IVC4f	2.1	12.3	54.4	24.9	1.8	95.5	0.4	0.8	1.2	0.8	2.5	3.3	gs	
3792	C1ca	1.1	5.3	15.9	34.0	8.8	65.1	12.2	11.6	23.8	4.5	6.6	11.1	fsl	
3794	IIC1	1.2	4.7	13.9	31.2	9.5	60.5	10.5	11.9	22.4	4.9	12.2	17.1	fsl	Cl/Si
3810	A11ca	0.2	1.3	3.0	5.6	0.6	10.7	16.1	70.2	86.3	3.0	0.0	3.0	si	0.04
3811	A12ca	0.4	1.7	3.4	5.4	1.3	12.2	18.3	66.1	84.4	2.7	0.7	3.4	si	0.04

PARTICLE SIZE DISTRIBUTION (PERCENT)

		Sand (mm)						Silt (μ)			Clay (μ)				
Sample No.	Horizon	Very Coarse 1-2	Coarse .5-1	Medium .25-.5	Fine .1-.25	Very Fine .05-.1	Total .05-2	Fine 2-20	Coarse 20-50	Total 2-50	Fine <.2	Coarse .2-2	Total < 2	Textural Class	
3812	IIC1ca	5.0	17.5	24.9	20.2	7.5	75.1	10.8	7.3	18.1	2.0	4.8	6.8	vgsl	.38
3813	IIC2ca	5.3	19.2	33.2	31.9	6.4	96.0	0.0	1.1	1.1	0.1	2.8	2.9	vgs	2.6
3814	IIIC3ca	0.5	11.0	30.0	46.0	8.3	95.8	0.6	0.0	0.6	2.0	1.6	3.6	s	6.0
3815	IVC4fca	15.2	30.4	29.6	19.3	2.4	96.9	0.3	0.0	0.3	1.8	1.0	2.8	vgcos	9.3
3816	Alca	0.6	3.1	5.8	7.4	1.9	18.8	18.5	58.4	76.9	3.4	0.9	4.3	sil	
3818	IIC1	0.5	2.0	4.2	11.4	4.7	22.8	24.6	43.2	67.8	1.2	8.2	9.4	sil	

SELECTED CHEMICAL PROPERTIES

Sample No.	Horizon	pH 1:1 (H_2O)	pH 1:1 ($CaCl_2$)	Organic Carbon (%)	Calcite (%)	Dolomite (%)	$CaCO_3$ Equivalent (%)
3177	A11ca	7.9	7.5	11.3	3.9	3.3	7.4
3178	A12ca	7.7	7.5	8.9	3.8	2.6	6.6
3179	IIC1	8.0	7.2	0.6	0.7	0.5	1.3
3180	IIC2ca	8.2	7.3	0.2	9.1	3.1	12.4
3181	IIC3ca	8.1	7.4	0.1	6.6	3.1	9.9
3182	IIC4	8.2	7.4	0.1	1.1	1.5	2.7
3294	IIC5	8.8	7.7	0.3	-	-	-
3258	A1	8.0	7.5	6.8	10.9	8.0	19.6
3259	B2g	8.1	7.7	1.1	17.8	3.4	21.4
3260	IIC1	7.7	7.5	10.1	5.1	4.4	9.8
3261	IIC2f	7.9	7.6	9.7	9.0	4.0	13.4
3262	IIC3f	7.8	7.6	3.1	21.3	4.0	25.6
3263	B2g	8.0	7.3	0.9	14.3	3.4	18.0
3264	IIC1	7.8	7.6	6.7	10.5	5.5	16.5
3265	IIC2f	8.0	7.6	6.7	13.2	6.4	20.1
3266	A11	8.0	7.7	9.5	13.3	7.0	20.9
3267	A12	8.0	7.5	9.8	1.9	3.4	5.6
3268	II021	8.0	7.6	14.1	1.0	2.7	4.0
3269	II022	7.6	7.0	24.2	0.8	1.2	2.1
3270	II023f	7.6	7.2	21.5	0.7	2.4	3.3
3271	IIICf	8.0	7.7	2.1	15.0	4.3	19.6
3272	01	8.0	7.6	12.1	10.8	6.8	18.2

SELECTED CHEMICAL PROPERTIES

Sample No.	Horizon	pH 1:1 (H_2O)	pH 1:1 ($CaCl_2$)	Organic Carbon (%)	Calcite (%)	Dolomite (%)	$CaCO_3$ Equivalent (%)
3273	IIC1	7.9	7.5	11.1	1.0	5.8	7.3
3274	IIC2f	8.0	7.7	9.1	10.2	9.7	20.8
3275	Oi1	8.0	7.6	6.9	17.5	8.2	26.3
3276	Oi2	8.0	7.9	6.1	21.0	4.9	26.3
3277	Oi3	8.2	7.9	5.9	22.1	5.4	27.9
3278	Oi4f	8.4	7.9	7.6	22.4	5.3	28.1
3279	A11	8.3	7.7	9.8	18.8	6.4	25.7
3280	A12cair	8.3	7.7	7.8	26.4	12.3	39.6
3281	Oe1	8.2	7.5	14.3	3.0	6.8	10.4
3282	IIC1	8.2	7.4	11.6	3.0	3.0	6.3
3283	IIOi1	7.4	6.6	15.2	-	-	-
3284	IIOe2f	8.0	7.2	18.3	2.2	2.6	5.1
3285	IIOe4f	8.2	7.4	14.7	3.6	3.5	7.4
3671	A11	7.7	7.2	7.5	17.2	5.9	23.5
3672	A12	7.8	7.2	6.8	14.7	7.6	23.0
3673	IIC1	8.0	7.2	7.1	10.2	4.6	15.2
3674	IIC2f	7.6	7.3	9.4	1.2	2.8	3.6
3676	A11	7.8	7.3	7.4	19.1	5.1	24.6
3677	A12	7.8	7.2	8.7	15.5	5.6	21.6
3678	A13	7.8	7.4	6.5	15.6	5.9	22.0
3679	IIC1	7.9	7.3	7.1	7.8	4.7	12.8
3680	IIC2f	7.9	7.6	7.5	11.4	3.7	15.4

SELECTED CHEMICAL PROPERTIES

Sample No.	Horizon	pH 1:1 (H_2O)	pH 1:1 ($CaCl_2$)	Organic Carbon (%)	Calcite (%)	Dolomite (%)	$CaCO_3$ Equivalent (%)
3681	01	7.7	7.4	15.3	17.2	4.8	22.4
3682	A1	7.9	7.4	7.0	18.5	5.1	24.0
3683	IIC1f	7.8	7.4	8.0	17.7	5.3	23.5
3684	011	7.6	7.3	6.0	18.3	6.0	24.8
3685	012	7.8	7.2	8.7	11.1	7.3	19.0
3686	IIC1	7.8	7.0	3.5	6.1	5.1	11.6
3687	IIC2	7.9	7.5	7.5	16.4	5.7	22.6
3688	IIC3f	7.7	7.4	10.0	12.3	5.0	17.8
3689	Oa1	7.7	7.3	12.5	6.2	6.3	13.1
3690	Oa2	7.8	7.5	12.5	5.1	5.0	10.5
3691	C1	7.8	7.5	2.4	15.7	6.0	22.1
3692	Oe1	7.6	7.2	12.5	6.4	6.5	13.5
3693	IIOa3	7.2	6.8	13.0	0.5	4.3	5.2
3694	IIOa4f	7.2	6.8	14.4	0.0	0.5	0.6
3695	01	7.7	7.2	8.4	15.5	6.9	22.9
3696	IIC1	8.0	7.4	8.5	26.2	3.2	29.7
3697	01	7.8	7.3	9.4	13.7	6.1	20.4
3698	IIC1	7.8	7.2	4.3	13.5	8.5	22.7
3700	011	7.4	7.1	16.6	7.9	5.7	14.1
3701	012	7.4	7.4	8.9	9.9	5.9	16.3
3702	IIC1	7.7	7.3	4.8	12.6	8.0	21.2
3704	011	7.7	7.2	12.0	10.8	5.8	17.1

SELECTED CHEMICAL PROPERTIES

Sample No.	Horizon	pH 1:1 (H_2O)	pH 1:1 ($CaCl_2$)	Organic Carbon (%)	Calcite (%)	Dolomite (%)	$CaCO_3$ Equivalent (%)
3705	O12	7.8	7.4	9.3	10.9	7.1	18.0
3706	IIC1	7.8	7.3	10.0	6.2	6.7	13.5
3708	O1	7.9	7.3	10.3	14.3	6.4	21.2
3710	C	7.6	7.4	-	8.4	2.8	11.4
3711	Oa1	8.1	7.4	12.5	9.7	5.8	16.0
3712	Oe1	7.8	7.4	13.6	0.5	4.2	5.0
3713	IIOa2	7.8	7.1	13.5	0.3	2.9	3.5
3714	IIOa3f	7.4	7.0	16.9	1.7	4.1	6.1
3715	Oi1	7.4	7.2	-	-	-	-
3716	Oe1	7.6	7.3	13.8	0.5	3.3	4.1
3717	IIOa1f	7.4	7.0	-	-	-	-
3718	O1	7.5	7.1	13.1	7.8	8.4	16.9
3719	IIC1	7.4	7.1	7.4	6.5	6.1	13.1
3720	IIC2f	7.8	7.2	10.9	14.0	6.6	21.1
3721	Oi1	7.9	7.2	19.5	0.1	0.8	1.0
3722	IIC1	7.3	6.7	3.5	7.6	5.0	13.0
3723	IIOa1f	7.9	7.5	13.5	3.0	3.9	7.2
3725	O21	7.4	7.1	14.1	9.5	5.3	15.2
3726	O12	7.8	7.4	20.5	0.1	0.6	0.7
3727	IIC1	6.6	6.1	1.2	10.6	5.0	16.1
3728	IIC2f	8.0	7.3	9.7	5.7	5.2	11.4
3729	C1	7.2	6.9	0.3	19.9	2.9	23.0

14.1
20.5
34.6

SELECTED CHEMICAL PROPERTIES

Sample No.	Horizon	pH 1:1 (H_2O)	pH 1:1 ($CaCl_2$)	Organic Carbon (%) OM	Calcite (%)	Dolomite (%)	$CaCO_3$ Equivalent (%)
3730	C2	8.0	7.3	0.4	23.5	3.5	27.3
3748	C1	7.8	7.5	1.0	21.1	5.7	27.4
3749	C2	8.0	7.5	1.4	21.6	5.9	28.0
3750	IIC3	8.0	7.3	1.4	20.8	5.2	26.5
3751	IIIC4	7.7	7.1	0.4	9.7	4.9	15.0
3752	IIIC5f	7.9	6.5	0.2	10.2	4.7	15.4
3754	Oa1	7.8	7.3	-	-	-	-
3755	Oa2	7.5	7.4	19.5 33.54	0.2	0.6	0.9
3756	Oa3	7.0	6.8	23.7 40.80	0.1	0.5	0.7
3757	Oa4f	6.6	6.3	25.0 43.00	0.7	1.1	1.9
3758	O1	7.5	7.2	-	3.8	2.3	6.4
3759	O2	7.2	6.7	14.3	0.2	0.7	0.9
3760	IIC1f	7.8	7.4	8.6	5.8	3.4	9.5
3761	Oe1	7.4	7.2	18.3	1.7	3.9	6.0
3762	C1	7.7	7.1	0.7	12.5	4.6	17.5
3763	Oe2	6.8	6.4	20.5	0.4	1.4	1.9
3764	Oa1f	6.4	6.1	26.1	0.2	0.5	0.8
3765	Oa1	7.8	7.6	13.0	17.9	3.3	21.4
3766	C3f	8.1	7.9	1.0	26.3	3.1	29.8
3767	Oe1	7.5	7.2	16.6	4.5	3.9	8.7
3768	IIC1	7.8	7.4	7.3	3.5	5.1	9.0
3769	IIOa1f	7.6	7.1	15.0	0.3	4.2	4.9

SELECTED CHEMICAL PROPERTIES

Sample No.	Horizon	pH 1:1 (H_2O)	pH 1:1 ($CaCl_2$)	Organic Carbon (%)	Calcite (%)	Dolomite (%)	$CaCO_3$ Equivalent (%)
3771	Oa1	7.6	7.3	17.8	9.3	4.7	14.4
3772	Alcair	7.6	7.3	11.9	13.8	5.7	20.0
3773	Oe1	6.9	6.5	20.4	0.2	0.9	1.1
3774	IIC1	7.8	7.3	7.3	5.7	5.9	12.1
3775	IIOa2f	7.8	7.4	15.1	2.3	2.9	5.4
3776	Oe1	7.3	7.1	17.0	6.1	5.2	11.7
3777	Oe2	7.4	7.1	18.5	0.9	2.5	3.7
3778	IIC1	6.8	6.0	11.5	0.0	0.6	0.7
3779	IIC2f	6.6	6.2	8.5	0.2	0.6	0.9
3780	IIOa1f	7.0	6.6	20.6	-	-	-
3781	Oe1	7.2	7.0	28.6	0.7	1.9	2.7
3782	Oe2	7.2	6.9	25.9	0.9	2.3	3.4
3783	Oe3	7.1	7.1	18.0	7.1	3.6	11.0
3784	IIC1	7.0	6.4	8.0	0.2	1.6	1.9
3785	IIOa1f	7.3	6.7	16.9	0.5	1.4	2.0
3786	IIOa2f	7.3	6.8	18.3	-	-	-
3787	A1	7.2	6.9	14.4	0.1	0.6	0.7
3788	C1ca	7.6	7.0	1.2	10.9	4.3	15.5
3789	IIC2ca	7.9	7.4	-	18.4	3.3	22.0
3790	IIIC3ca	7.9	7.3	-	10.3	7.3	18.3
3791	IVC4f	7.8	7.4	-	2.8	4.0	7.1
3792	C1ca	7.9	7.6	-	6.8	3.3	10.8

SELECTED CHEMICAL PROPERTIES

Sample No.	Horizon	pH 1:1 (H_2O)	pH 1:1 ($CaCl_2$)	Organic Carbon (%)	Calcite (%)	Dolomite (%)	$CaCO_3$ Equivalent (%)
3793	Oil	6.8	6.3	22.4	0.3	1.4	1.8
3794	IIC1	8.0	7.9	-	10.4	6.0	16.8
3795	IIOi2f	7.1	6.7	19.3	1.7	3.2	5.2
3796	Oe1	5.5	5.0	27.5	-	-	-
3797	IIOa1	5.4	5.1	20.5	-	-	-
3798	IIOa2f	5.6	5.1	22.0	-	-	-
3799	Oe1	5.4	5.1	26.4	-	-	-
3800	IIOa1	5.6	5.2	17.1	-	-	-
3801	IIOa2f	5.6	5.0	20.0	-	-	-
3802	Oa1	6.1	5.7	30.0	-	-	-
3803	Oe1	6.0	5.4	29.5	-	-	-
3804	IIOa2	5.6	5.3	19.4	-	-	-
3805	IIOa3f	5.6	5.4	29.6	-	-	-
3810	A11ca	7.5	7.0	10.2	5.0	3.8	9.1
3811	A12ca	7.9	7.3	9.7	7.0	4.8	12.2
3812	IIC1ca	8.2	7.6	0.2	18.1	5.3	23.9
3813	IIC2ca	8.2	7.3	-	3.4	4.5	8.3
3814	IIIC3ca	8.2	7.4	0.4	5.1	4.5	10.1
3815	IVC4caf	8.1	7.2	0.2	3.9	4.5	8.8
3816	A1ca	8.0	7.4	8.7	7.4	5.8	13.6
3817	O1	7.7	7.3	9.8	10.8	5.6	16.8
3818	IIC1	7.8	7.1	6.4	10.6	10.5	22.0

APPENDIX C

GLOSSARY

aquic moisture regime: class of soil moisture regime denoting reducing conditions; water table is subject to fluctuations (intermittent saturation)

calcic horizon: a layer at least 15 cm thick having secondary accumulation of carbonates (usually of Ca or Mg) with $CaCO_3$ equivalent usually exceeding 15 percent and also having: (1) at least 5 percent, by volume, identifiable secondary carbonates, or (2) 5 percent more carbonate than an underlying layer

cambic horizon: usually a subsoil horizon expressing weak genetic soil development

control section: the vertical portion of the soil pedon arbitrarily defined in terms of a depth range used for classification purposes

fibric material: highly fibrous organic soil material having a fiber content of 40 percent or more of the soil volume after rubbing

hemic material: somewhat fibrous organic soil material, intermediate in decomposition between fibric and sapric material

histic epipedon: surface horizon consisting or organic soil material less than 40 cm thick and greater than 20 cm thick

mollic epipedon: diagnostic surface horizon, containing over 6 percent organic carbon, having Munsell color value and chroma less than 3.5 when moist

pedon: the smallest volume recognized as a soil individual

peraquic moisture regime: soil moisture regime denoting conditions of continual saturation, i.e. water table is constantly at or near the surface

pergelic temperature regime: soil temperature regime denoting mean annual soil temperature lower than $0^{o}C$ (implying permafrost)

pingo: mound created (uplifted) by hydrostatic forces induced between freezing fronts

polypedon: a group of contiguous pedons that fall within the defined limits of a single family or soil series

sapric material: highly decomposed organic soil material with a fiber content of less than 16 percent of the soil volume after rubbing